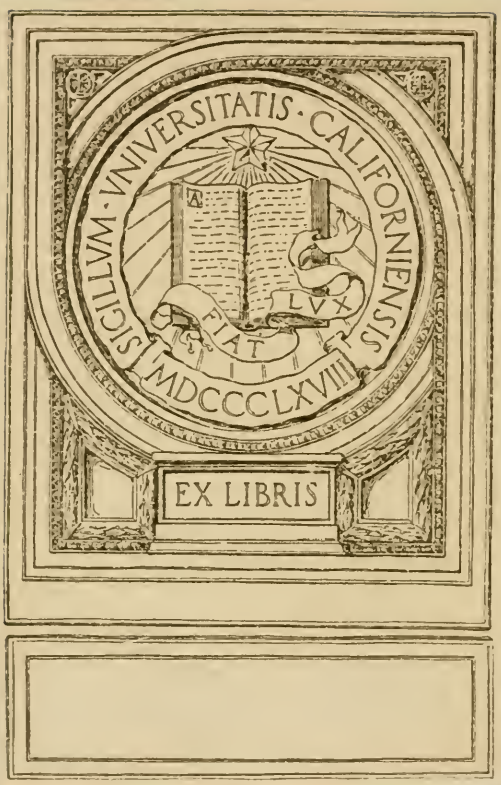
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# MODERN SURGERY AND ITS MAKING

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*Lord Lister P.C. O.M. F.R.S.*
*From a photograph by Elliott & Fry*

# MODERN SURGERY AND ITS MAKING

## A TRIBUTE TO LISTERISM

BY

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# PREFACE

The motives and purposes of this book are in part personal and in part public. The personal motives are gratitude for great benefit lately received from surgery, desire to make some reparation for too hard words spoken of the surgical profession some years ago under stress of intense and painful conviction, and also a desire to make an *apologia* for the form of my public activities.

The public motives are, to state the case for surgery and therefore for science, in modern society; once more to challenge the anti-vivisectionists; to demand the first of what I call the Rights of Mothers, from my standpoint as a Eugenist; to state the women's share in this most beneficent of human achievements; and to discuss the place and needs of surgery in the new experiments for national control of disease, towards which modern politics is tending.

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# MODERN SURGERY AND ITS MAKING

## CHAPTER I

### INTRODUCTION

The lack, as late as the second decade of the twentieth century, of any book devoted to the most beneficent achievement in the entire record of science, is not easily to be credited, nor satisfactorily to be explained. But the fact and the explanation may duly be considered here.

There are to be found inaugural addresses, delivered to medical students or on other academic occasions; a few magazine articles; the volumes of the collected papers of Lord Lister; the well-known life of Pasteur; and chapters, of course, in modern surgical text-books—all dealing with one or another aspect of our present subject. These, however, are for all practical purposes almost non-existent so far as the general public or the politician is concerned; and, even taken together, they are not equivalent to what a complete statement of the deed and the modern need might be. The uses of such a complete statement may be very imperfectly attained in the following pages, but at least they will demonstrate that, though the want for such a book is by no means "long-felt," it most assuredly should have

been, not merely for the purposes of general culture, nor just appreciation of greatness, but because of the many public needs which are involved in Listerism and cannot be met until public opinion is acquainted with the facts.

It was with astonishment and incredulity, some years ago, when planning the New Library of Medicine, that I failed to discover any existing book devoted to this subject, of which the importance increases daily as the powers of the surgeon become more extended. One knew that such questions as Infant Mortality and the Prevention of Tuberculosis and the Hygiene of Mind had never been properly dealt with in any organic and complete manner, either for the public or the profession. Surprising though these *lacunæ* were, they could be understood, for the daily preventable slaughter of infants had to wait for attention until the development of what may be called the Public Health Conscience in the community—and that is scarcely yet a stripling; and, similarly, the prevention of tuberculosis could not be dealt with until the discovery of the tubercle bacillus and its modes of transference from the sick to the sound. But though the books of Sir George Newman and Dr. Newsholme and Sir Thomas Clouston should doubtless have been written long before, they were not nearly so overdue as a volume on Modern Surgery, its history, its powers, and its place in the State; for, after all, however inadequate the public consciousness of the fact, this mighty deed, to which we are one and all at this hour incalculably indebted, dates as far back as the later sixties of the nineteenth century for its essential doing.

Lord Lister himself, in a letter which is a cherished possession, declined on the grounds of advancing

years the proposal to write the book. The Victorian dignity and courtesy of his refusal were sufficient to remind one of what age he is indeed a glory. Two or three of my personal friends amongst contemporary surgeons refused on one ground or another—principally, perhaps, because they considered that, in their hands, the knife was mightier than the pen. Assuming, at that time, that only a surgeon could suitably write the needed book, I gave up, for the nonce, the search for an author. But as the years have passed, and medical and surgical questions have more and more taken on their social and national aspect, not least in relation to the urgent, ominous, scandalously neglected needs of the nation's school children, as revealed by medical inspection, it has seemed clear, first, that this book must be written forthwith, the public ignorance of the subject being shown to be no longer a defect in culture merely, but a defect in citizenship; and, second, that from some points of view there may be an advantage in the presentation of the case by an author who, whatever his defects, speaks of what he knows at first-hand and has lived with day and night, but does so without any personal or professional bias, not being himself engaged in any form of medical or surgical practice. His recollection of the details of surgical technique or of surgical anatomy may very well be neither too accurate nor too precise, but these do not concern anyone but the operator as operator—who is the one person to whom these pages are not addressed, except in so far as they deal with the question of his economic status in society, with its manifold anomalies, injustices, and inefficiencies. On the other hand, it may well be that a writer who could only injure himself by over-

statement of the case for surgery, or by any misdirection of the public, may gain a wider and more patient hearing than might possibly be accorded even to an illustrious and fair-minded surgeon.

The public advocacy of new ideas demands endless reiteration. The repetition must be so continuous, long-maintained and if possible varied, that, at last, by the action of certain psychological sequences which are well worthy of study for their bearing upon national policy and conduct, people begin to suppose that these ideas and arguments are their own, and that the advocate is a platitudinarian. It is only when, having long thought him mad, they think him dull, that he may congratulate himself on having done his work. On certain primary aspects of Eugenics or Race-Culture, to which this pen and voice have long been dedicated, it really looks as if the public were won and even the politicians must follow. It therefore seems permissible and opportune, lest much nagging at the public ear make even the enthusiast weary, that he should turn somewhat aside for a while in order to deal with a subject which urgently demands treatment, and without the due appreciation of which even Eugenics must lose much of its value.

So much may suffice, perhaps, for stating the fact that this book still needs to be written, and the circumstances which have led up to the present undertaking. But something now falls to be said in reference to what we began by stating—that no satisfactory explanation is forthcoming for the absence from our libraries of any book devoted to this subject.

It is not that the writing and publishing of books is almost wholly a matter of private enterprise, utterly unco-ordinated and tragically dominated

by the public demand. For anyone, however, who holds books in high esteem—even though he may not go so far as to believe, with Carlyle, that the real university is a collection of books—and who is convinced that it matters greatly, for private and public conduct, what books we have read and what we have not, it seems a question worthy of discussion, at some other time, whether the writing and reading of books that deal with the world and with knowledge as they are and will be, do not demand the employment of as much organized thought as is now devoted to the study of books which deal with the world and knowledge as they were. We have at present the extraordinary situation that the public, young, middle-aged, or elderly, derives its ideas and its information upon all the scientific matters whence the modern weapons of international competition are forged, from the daily press to the practical exclusion of anything else, and without the previous training which would enable it to judge and to profit by this means of instruction, with all its risks and randomness. Now what may be the success of educated democracy it remains for the future to discover, the educated democracies of to-day being neither really educated nor really democratic, with the possible exception of Switzerland. But assuredly uneducated democracy will not work, now nor at any other time; and it has no chance whatever in international competition with an expert bureaucracy, such as is now guiding modern Germany to her evidently exalted destiny. Plainly, therefore, much might well be said on this question of our public reading, and the character of the provision therefor.

But whatever may be the inadequacy of private enterprise in the provision of books, the real ex-

planation, in all its unsatisfactoriness, of the public ignorance on this question now under discussion, and a thousand others, lies in the national attitude towards science, the national preference for quick returns, and the cash-estimate of all human affairs. If ever a country produced pioneers in knowledge, England has done so. Bacon, Locke, Newton, Harvey, Spencer, Darwin, Kelvin, Lister—these, set down at random, would suffice to extort the admiration of the world. But the nation which produced these men is also a nation of shopkeepers, and of squires, and of belief in the omnipotence of sheer valour, and even the partial insanity of any who devote themselves to knowledge primarily for its own sake. The visible and the concrete we can accept: but even the visible must be visible to the naked eye: microscopic is semi-mythical. Thus, in the matter of health, we have long led, and still lead the world in primary sanitation. Drains and water-supply we can credit and take to; the appeal to theoretical considerations or to the invisible in general is not required, and public opinion requires no winning over: at least we have noses.

But theoretical considerations are ever becoming more and more important in the advance of knowledge and practice. In general it is fair to say that the day of empiricism is past. We can no longer afford to "muddle through." The inventions and achievements of to-day, whether in such a practical realm as that of applied electricity, or in the treatment of disease, are most definitely *not* the results of happy chance, of guesswork, of intuition, or of sheer patience. They require and depend upon the theoretical considerations which strike the popular mind as unreal or unimportant. This is true of surgery itself.

The word surgery simply and literally means hand-work. The physician was the student of Nature, as his name suggests; the chirurgeon was the "manual labourer" in a Greek dress—obviously a practical person. But the mere literal "surgery" is the very least of modern surgery, and will be even less important in the surgery of the future. Uses will always remain for dexterity, and advantages can still be demonstrated in some measure for celerity. But the difference between the surgery of to-day, the beneficent science which daily saves countless lives, and the surgery that was in the world until Lord Lister dawned, in no degree whatever depends upon any advance in surgery proper—that is, in the manipulations, the skill and speed, of the operator. This colossal revolution in practice entirely depends upon theoretical calculations; and it may well be doubted whether, in sheer operative skill, the surgeons of half a century ago could be equalled, much less surpassed to-day. As operative skill was then everything, naturally it was developed to the utmost. It is so much less than everything to-day that the modern Listerian nurse, who has never grasped a knife in her hand, is a vastly better surgeon, in a very true sense, than the greatest practitioners of half a century ago, as we can realise at once if we choose to compare their respective methods of dressing any wound whatever. The vital difference entirely depends upon theoretical considerations: upon abstract conclusions, reached for their own sake, by processes of reasoning verified by experiment, and unrelated altogether to the existence of such a thing as a knife at all.

The national neglect of science is a national menace, as the responsible leaders of the scientific

world have again and again declared from the Presidential Chair of the British Association and elsewhere. Our practical genius is so great that, in certain directions, our scepticism of science as such seems to do us little harm. It is declared that no single invention of the first rank in engineering or electricity stands to our credit for many years past. But notwithstanding our defects in this regard, and such obstacles as the law which prescribed a man with a red flag in front of every mechanically-propelled vehicle, we constantly contrive to lead the world, it would seem, in the mechanical arts.

As I have often declared, however, the culture of the racial life is the vital industry of any people; and if this be true universally, as it is, even more abundantly than elsewhere is it true of us, with our world-wide Empire, our practically uninhabited Continent "down under," our small and rapidly falling birth-rate, our addition of only one child to our numbers for every two in Germany, and, lastly, the appalling needs of our next generation as revealed by medical inspection of school children. Now though any man may make a useful and honourable and beloved family doctor who is destitute of science altogether, the making and maintaining of a healthy population under the conditions of urban aggregation can be achieved by science or not at all. The science of life underlies the life of nations as it underlies the lives of individuals. Both alike live or die according to their consonance with the laws of life, whether those laws happen to be known or unknown. It is these laws of which we see the consequences in our yearly more unsatisfactory recruits, and in the countless numbers of children who need surgical intervention in England at this hour

if they are to be saved for themselves and for her. And it was the laws of life which Pasteur and Lister elucidated, and which have transformed the practice of ages. The tree of life and the tree of knowledge, which grew side by side in Eden, and the tree of life, whose fruit and leaves were for the healing of the nations in the Holy City, are all one: as we must realise if we are to make our cities and citizens holy and healthy—which are two forms of the same word.

Let this introductory chapter end, therefore, with two appeals, or at least with the statement of two definite needs of our own time in this matter of vital knowledge. First as to its gaining, and second as to its giving.

In order that knowledge shall be gained the labourer must be provided for, both as to his personal and his scientific needs. In every branch of surgery, from the problems of cancer downwards, there is need for more knowledge. Only in small and accidental degree can this knowledge be now obtained by the observation of the surgeon in the course of his work. The fundamental advances in the chemistry of life and of vital reactions can only be made, under specially devised conditions, by specially trained workers who set themselves to the problems in question. The extant provision for such workers is ludicrously disproportionate to the need. Those who can may explain the fact that in the United States of America the philanthropic or otherwise-actuated giver provides funds for research on the most magnificent scale, whilst in this country only the recently established Beit Medical Fellowships, founded by an alien, can be quoted on any comparable scale. No one can question that it must be very

pleasant for the kind-hearted to reflect that there is somewhere a hospital bed or an out-patient department, daily doing the work of healing, which they have endowed. But, if only they could be made better acquainted with the history of the healing art, they would see that provision for genuine research was certain, in the long run—not necessarily so very long—to do far more for human health and happiness than the generosity which it seems, at first sight, impossible to direct more wisely. Would that one could bring to the notice of the charitable and wealthy the profound words of Ruskin, which apply in such full measure to the present argument :—

> ". . . . it is one of the appointed conditions of the labour of man that in proportion to the time between the seed-sowing and the harvest is the fulness of the fruit, and that generally therefore the further off we believe our aim, and the less we desire to be ourselves the witnesses of what we have laboured for, the more wide and rich will be the measure of our success."

It is by no means to be supposed that the post makes the researcher, or that the number of those who would apply for such posts is the number of those fit to fill them. Many are called but few are chosen. The tragedy is our present mishandling of those few. One man can search, another can teach. The two capacities may be united, but there is no necessary connexion between them. The born researcher is probably as rare as the born teacher ; and he is indispensable. Frequently he chances to be almost inarticulate. Now the English method of rewarding a man for research is to give him

a post as a teacher. Very likely he is not the best teacher available, even if he be able to teach at all; and the best teacher, who may have great capacity of thought and illustration, but none for research, may be left in the cold. Worse than this, the researcher is commonly sterilised by his reward. Often, alas, his success means the disappearance of the external inducement to work which all but the very fewest require. There is no end to the list of those who have done good work, gained a post, and never done any more. But even if the man desires to work he has his teaching duties to discharge, and these take up, with incalculably less profit to the community, the time and energy that should be devoted to the task for which he is fitted. The whole system is fundamentally wrong, and sounds as if it might have had its origin in the virgin nescience of some past "statesman," so called. The proper reward for the man who is a born researcher is to give him better opportunities for research and due honour for the work he does. These opportunities will mean not merely a good stipend—something, say, comparable to the salary of a superior clerk, society journalist, or second-rate comedian—not merely the provision of apparatus and funds for experimental research upon the lower animals, but, above all, opportunities for attracting, directing, and inspiring those who are to come after him.

Internecine jealousy still postpones the establishment in London of an Institute of the Medical Sciences, towards which a promising start was made a few years ago. London is the home of many distinguished practitioners of the medical arts. It is not a great centre of medical and surgical science. Nor can it become so until our notions of the relative

importance of theory and practice, and our provision and reward of them in proportion thereto, have undergone fundamental revision. And if anyone should suppose that this is casual or unconsidered criticism, unmerited by the facts of the case, let him consider the circumstances and history of the greatest centre of physics in this country, the Cavendish Laboratory of Cambridge. The student of physics knows the facts; and the recent publication of a volume to commemorate the twenty-fifth year of Sir J. J. Thomson's tenure of his post should have informed a larger section of the thoughtful public. The feature of that Laboratory is that it is the home of an illustrious man, whose school, there founded and maintained, leads the world in its great branches of inquiry, and bids fair to continue to do so, whilst the genius and patience and energy of "J. J." remain there to attract the few best-endowed young men of each decade.

It is probably impossible to over-estimate the significance and the ultimate practical importance of the work done at the Cavendish Laboratory. Perfectly conceivable is the speculation that the study of electrical and molecular forces, and of physical chemistry, there prosecuted, might give us the understanding of the behaviour of the malignant cell, which might instantly supersede the whole surgery of cancer. But however highly we rate the work of that wonderful place, we cannot question that it should have its compeer in the biological realm. The days of "natural history," of field botany, and of the descriptive systematist will doubtless never be past; but in our age we have a new science, well named biology, which must sooner rather than later assume the experimental form which is indispensable for the physical sciences. Men of genius, specialised

in this direction no less definitely than Sir Joseph Thomson in his, may now exist in England, and doubtless do; but the right field for them is not forthcoming. The mutual jealousy of the hospitals, which has for many years served to reduce the number of medical students in what should evidently be, having regard to its wealth and its unexampled abundance of clinical material, the greatest centre of medical science in the world, has prevented and still prevents London from possessing what, but for this despicable and suicidal policy, might well be the due parallel in biological medicine of the Cavendish Laboratory.

Perhaps enough will have been said to show that the medical and surgical profession is really in an anomalous and untenable position to-day. Its members seek to exist by their private and individual services to individuals, as the barrister or solicitor does. But the profession of healing has another function to which that of law offers no parallel. It has a branch of science in its keeping; and the time has very nearly if not wholly passed when a practitioner such as was Joseph Lister can, simultaneously with the practice of his profession, institute biological experiments, which transform one of the major facts of human life. The public and the philanthropic and the State must learn that the time has come when competent men must be supported in decency and certainty whilst they discover the natural facts and laws upon which the future progress of medicine and surgery depends. These practical arts depend upon certain sciences for the adequate prosecution of which there is no sufficient provision in this country. The charitable may be assured that, if they will be patient and faithful, their beneficence

will be proved more beneficent if it be devoted to the prosecution of research than if it be content with immediate results.

And, finally, it must be insisted that the business of the doctor is not only to learn but also to teach. Literally, the doctor is a teacher; actually, amongst ourselves to-day, he is almost anything but that. Yet, already, just and necessary as is the demand for more knowledge and the means thereto, we possess a great mass of assured knowledge in medical and surgical matters which it is the duty of the profession as a whole and by means of its individual members to force upon the consciousness of the community. We have as yet, to take the education of the governing powers, no Ministry of Health, nor even any adequate status for the medical sciences in the Local Government Board. We have only just admitted these sciences to the Board of Education, *à propos* that medical inspection of school children which has already revealed more surgical need than we have surgeons existing to supply. We have far too few medical members of Parliament; though that grave defect may be remedied when, as appears possible, the House of Gramophones is transformed and becomes a House of Men. In the national services we still have an abundance and to spare of the spirit represented by the remark of a famous Field-Marshal, still living, that "Medical advice is a very good thing —when it is asked for."

Similar criticism is applicable when we ask to what extent the doctor is literally a doctor of public opinion in general. The profession has not realised its true dignity as in major degree the guardian of the body-politic. The conditions of medical etiquette and professional jealousy severely limit the activities

of those who might otherwise devote themselves to the literal business of doctoring. Coming to London nine years ago, with the intention of serving terms in certain special hospitals for the purposes of practice, the present writer, full of enthusiasm for the great benefactors of mankind whose names had been daily in his ears in Edinburgh, was astounded and horrified to be asked by intelligent and cultured people, thoroughly interested in and *au courant* with the affairs of the time, such questions as " Who is Lord Lister ? " It was too outrageous, and one set to work to tell a few people, by means of the public Press, and on the few platforms then accessible, who Lord Lister was, and to answer a number of similar questions. But unless one was content either to be a gramophone—without the Parliamentary *kudos* —or else to go gagged, it was necessary to abandon all professional practice whatsoever, and taking the highly hazardous and novel step, as it then was, I did so ; and thus am answerable to no smaller body than the public at large ; nor can it be urged that anything I write or say is for the attraction of patients. But it is a most unfortunate and disastrous state of things that those who have qualified themselves in some measure for the task of public instruction by means of a prolonged and expensive education should be practically barred, as they are, from fulfilling this function, which is evidently of the utmost value and necessity, unless they can somehow contrive to live without practising at all. It will be agreed that the public Press now contains far more medical news and instruction, on the whole most desirable and suitable, than when I published the many articles on Listerism and infant mortality, alcohol, consumption, and so forth, for which so

much criticism was forthcoming. But vastly more remains to be done. On these vital matters we have an instructed profession and a public which is ignorant beyond belief—necessarily so, of course. The profession in question is just as ignorant of engineering or law or philology, and assuredly has no monopoly of ignorance or narrowness. But these many things which it does not know are not vital, and do not need to be known by everyone ; whereas its special knowledge directly affects the life, health, and happiness of every man, woman, and child, present and to come, and is of limitless potency in determining the destiny of our nation and our race. The doctor, then, should *be* a doctor ; and it may well be urged that, since the State, by practically universal consent, regards the business of education as its concern, it should undertake the task of national education in these most vital of directions. One can vaguely imagine the existence of a department, in some future Board of Health, which would concern itself with such activities as are instanced by the French official posters against alcoholism, and with the maintenance and direction of lectures to teachers and to the members of the many societies which concern themselves with social well-being. Under the *ægis* of a great department of State, disinterested and authoritative, such lectures would have the greatest influence, not least upon the *habits* of the people, which the general practitioner, and especially the " club " doctor, can scarcely afford to criticise.

To consider more especially the matter of surgery, let us turn to one more fact which should alone suffice to warrant the publication of the following pages. As regards surgical operations in the general hospitals, nothing can be more important for the public

welfare than that these institutions should command the confidence of the community; that patients should be willing to consult them early—as, for instance, in the widespread and disastrous malady commonly known as surgical tuberculosis, which attacks so many valuable joints and bones and glands; that parents should be eager and happy to entrust their children to the surgeon's care in such cases; that the early symptoms of malignant disease should bring the patient, before his chance is gone, under the surgeon's eye; and that, when operation is recommended, the advice should be followed. Never shall I forget the first instance in my experience of refusal of operation. A girl whose foot was riddled with tuberculosis consulted the surgeon, who advised amputation. The foot could never by any chance be of any use again, and it was a source of grave danger. The girl and her father refused to have the operation performed because they believed that its object was not curative but experimental.

For though the profession does not as yet undertake the task of teaching the public in these matters, some of its enemies are wiser in their generation. The anti-vivisectionists, above all, devote unstinted energy and large funds very extensively to the task of attempting to undermine the public confidence in the hospitals, above all by the argument that the patients are regarded as subjects for experimentation. The vivisector, they say, warms to his work, and when he is sated with the blood of his animal victims he only longs to turn his knife upon his fellows. Thus to enter a general hospital, more especially one to which a medical school with a physiological laboratory is attached, is to submit oneself

to what is practically none other than vivisection of the human subject. The fact that the physiologist has quite enough to do in his own department, or that the surgeon can safely acquire the skill and knowledge for certain operations only by first performing them upon the lower animals—such things are left unsaid by these sincerely unscrupulous fanatics, and by everyone else.

From 1902 until 1906 one of the subjects to which I devoted myself by pen and voice was this matter of vivisection and the asserted experimentation upon human beings in hospitals; nor can I recall anyone else who was doing that work of public education except for the standard book of Mr. Stephen Paget. We now have, however, a Research Defence Society, which exactly conforms, for its particular sphere, to the demands of the foregoing pages. It is a society primarily of medical men who are banded together not for the gaining of knowledge, but for the giving of it. By letters to the Press, by the distribution of leaflets, by posters, and by popular lectures, they undertake that very work of public education on vital medical and surgical matters for which I plead. But though nothing could be better or more useful in its way, the Research Defence Society is confined to meeting only one need in this matter, and is, in fact, none other than the response and antidote to the long-continued educational labours of the anti-vivisectionists, but for whom, as its name suggests, it would never have come into being. Vastly more than this is needed; but the Research Defence Society and Mr. Stephen Paget, its Honorary Secretary, will have accomplished much more than their immediate purpose if their methods and their success and the evident need for their existence can be em-

ployed as the models for future organisations, on similar or parallel lines, which may devote themselves, with adequate funds, with the prestige of well-known names in association, and without suspicion of self-interest, to a multitude of matters, such as those already alluded to in this chapter, wherein the public education is defective, or where, indeed, a vast amount of public misdirection by interested persons is constantly going on.

There are, for instance, the large numbers of persons who daily hire the columns of the Press in order to advertise their nostrums for the cure of varicocele, hæmorrhoids, hernia, adenoids, nasal obstruction, and other surgical conditions, claiming that operation is to be avoided as disastrous, and is in any case rendered superfluous by their alternative. Now there is no occasion whatever why, in this age of surgical achievement, a living should be obtainable by these persons for daily injury of the public. As I am not a surgeon I must necessarily be acquitted of any personal bias in declaring that these people are amongst the vermin of society, thieves not only of money but of health and of life, and that, since no educated community would tolerate them for a moment, it is the business of those who have the knowledge to impart it by some means or other. The mere selling of aperients—of which most patent medicines consist—at absurdly high prices is a legitimate and useful trade compared with what we are now discussing. As we have seen, the Press is now beginning, in its news columns, to furnish some antidote to the lies which appear in the advertisement columns of most papers; but surely it would be to the public interest greatly to advance the general standard of knowledge in such matters.

Another case is that of the so-called "hypnotists," "bloodless surgeons," and the like, who occasionally infest the lower-class music-halls. It seems to be no one's business to deal with these impostors, except when they use the letters M.D. without due title. In 1905 I went to the Holborn Music Hall for the purpose of exposing the best-known of these practitioners, and the reading of my article to the jury in the Judge's summing-up at a subsequent law case seems to suggest that it may have contributed to put an end to his noxious career. The number of tuberculous joints in which this person must have set up new mischief by his brutal and destructive methods cannot be stated; and it is a scandalous reflection on the state of the general intelligence and information that such things were ever permitted at all.

With one other illustration of the argument that we need more public knowledge, this long introductory chapter must draw to a close. Every surgeon knows that only a tiny minority of cases of cancer are ever seen by the surgeon in time for him to effect the radical cure which, in many instances, would have been possible. Recent detailed study of the mode of spread of the disease only throws greater stress upon the all-importance of early operation. "They all come too late!" is the surgeon's comment, not least upon the endless company of women suffering from cancer of the breast or womb. But why do they come too late? Surely not because they prefer to do so. They know no better, and there is no one to tell them. In Germany a little has been done in this regard by means of a newspaper campaign. In England it seemed to me a few years ago that something might be done, and I therefore asked a distinguished

surgeon to contribute a volume on the subject to the New Library of Medicine. An admirable volume was the result,* but I fear it must have sadly disappointed the author and the publisher, for its sale was trifling, though it contained information and advice of literally vital moment to more than one-tenth of the adult community. It certainly appears to me that some society or organisation ought to exist, in this Listerian age, which has for its business the instruction of the public on this one matter alone, so that the means of salvation which, thanks to modern surgery, are available in a large proportion of these cases may be taken in time by more than one in a thousand of those whom this malady attacks.

Such an extension of the benefits now offered by surgery to the community can never be attained, however, until by some means or other the safety, the comparative painlessness, the enormous and peerless advantages, the ever widening scope of this art, and the high standard of capacity and honour amongst its leading practitioners, are made matters of universal public knowledge. For a constantly increasing proportion of the community, which must certainly be more than one-half already—and for every one of us, if we have those whom we love—the time will come when the surgeon can do for us what no combination of other persons can. Such being his rank amongst us, we should hold him in the highest confidence, acquaint ourselves with his powers, avail ourselves of them in due season, facilitate his work, and ensure his surpassing in years to come by means of provision for the gaining of further knowledge.

* *The Control of a Scourge*, by C. P. Childe, F.R.C.S. The New Library of Medicine, Methuen & Co.

It is as a humble effort towards these ends, and in gratitude for personal benefit received, that this book has been written. And perhaps a single illustration will suffice to show that its praise of a great man is not superfluous—no, not in his own country. Recently a Parisian paper, and one of our own, held polls of their readers, in order to ascertain who were considered the greatest men—in the first case, of all that France has produced, and in the second, of our living countrymen. The French electorate voted for Pasteur, the greatest benefactor of mankind hitherto, and he upon whose shoulders Lord Lister stood when he discerned the possibilities of modern surgery. It was indeed a just choice, reflecting some credit upon those who made it. They might have voted for the greatest slayer in history, but preferred the greatest saviour.

But observe what was the choice of the readers of the English paper. He was a politician, at that time the idol of the crowd. His name dominated all others for the crowds that awaited election results in 1906; it scarcely raised a response in 1910. But only seven years ago he was ranked as the greatest living Englishman: Lord Kelvin, and Mr. Alfred Russel Wallace, and George Meredith, and Herbert Spencer, and Lord Lister were then still with us. Such were the riches from which the many—nor by any means the lowest of the many—were asked to choose: inventor, interpreter, seer, philosopher, and saviour; and they chose a politician.

In order to be saved it is necessary that hero-worship shall flourish; but it is essential that the heroes shall be heroes indeed. For though it must be evil to worship no gods, it is surely worse to worship false ones. And if national education is to be what

it purports to be, indeed it must ensure that our choice of ideas and ideals and heroes shall be high and wise and discriminating. The nation which could anticipate the verdict of posterity upon its prominent men would be an educated and happy nation indeed. In some cases it is not necessary to wait for posterity; less than a lustrum may suffice to overturn a popular idol. But how comes it, then, that whereas our French neighbours chose Pasteur, our compatriots chose a politician? His name matters not at all; had he been Salisbury or Gladstone or Disraeli the verdict would have been just as ludicrous. For such men come and go, and may serve their generation well; but their natural rank is negligible compared with that of the appointed few who create and who perceive. The thoughts and deeds and lives of mankind will always be richer, happier, wiser, saner for the work of the men I have named; and the crowd chose a politician.

Such an error I take to be of profound significance as a key to the real measure of public enlightenment. It can neither be excused nor satisfactorily explained; and it should be regarded as a verdict of condemnation upon our methods of education, formal and informal, upon schools and colleges, churches and newspapers, and all other agencies which concern themselves with our instruction and direction. It does not for a moment suffice to urge that in this country, unlike France, we have a great Imperial idea, and cannot but exalt those who represent and advocate our national glory and military ascendancy. Let it be granted that these are great and dominant ideas. If that be so, incomparably the greatest member of our military and naval state was Lord Lister, whose genius has transformed the conditions of warfare

and served the soldier and the sailor as they were never served before. Surely we must exalt not so much the man who makes wars as the man who wins them ; and though our surgical standard in the Boer war did not approach that of the Japanese in their campaign (which Lord Lister indeed won for them), yet no educated or quarter-educated nation that had just emerged from a disastrous war in which many lives had been lost, but many saved by the genius of one of its own number, would question his title to pre-eminence over all its politicians put together *in their own field*, to consider no other.

The race of heroes is not extinct ; there will be giants in days to come. Great pioneers in medicine and surgery, in statesmanship and literature, are safe in the womb of Time ; and we may produce some of them. But if we are to deserve them, and duly benefit by them, and avoid the risk of stoning our prophets, we really must begin to question ourselves soberly as a nation and ask whether, in our present estimates of worth and honour, we are not repeating the ludicrous error of our predecessors, who filled Westminster Abbey with the effigies of warriors and politicians for us to jeer at, and treated their greatest as we treat ours.

Hence I offer to the reader's consideration the following pages, bearing upon the work and value for all coming time of him " who saves more lives in every year than Napoleon took in all his wars."

## CHAPTER II

### SURGERY AS IT WAS—THE INTRODUCTION OF ANÆSTHESIA

Surgery of some kind is doubtless almost as old as the human race, yet its history, until the second quarter of the nineteenth century, scarcely needs writing. Bold and skilful operators there had been whose procedure was imitated with more or less success by their followers. These men, such as John Hunter, contributed substantially to anatomy and to surgery as a craft, but surgery as a science was scarcely developed by their work. Something was learnt regarding the control of hæmorrhage. The introduction of the ligature, by which a cut vessel is tied, was a real advance on the almost indescribable methods which it superseded. Yet when we survey the entire record of the past until the dawn of our own times, and still more when we observe the facts of surgery as it was less than a century ago, we perceive that here, as elsewhere, first principles are all-important. Until their discovery the centuries and the millennia may succeed each other, but the Millennium is no nearer.

Less than one hundred years ago surgery continued to be what it had always been—a desperate remedy for desperate diseases. Two enemies had to be fought, each in vain. The first was the enemy of pain, for which no efficient drug existed ; the second

was inflammation, the causes of which were unknown, and which not the most skilful of operators could control in any degree at all. Of these the latter was by far the more important, so far as the ultimate issue of the operation was concerned, and the key to its control was not obtained until the immediate pain of operation had been mastered. It is necessary to say the immediate pain because inflammation is painful, and Listerism has averted as much pain as anæsthesia.

Within one-quarter of a century the two enemies of the surgeon, hitherto unbaffled, were conquered for all time. We may name 1847 as the first notable date and 1868 as the second, the first seeing the introduction of chloroform, and the second of carbolic acid. We must briefly recall the birth of anæsthesia in order that we may see what surgery was when Pasteur and Lister intervened, and also to remind ourselves how incalculably the introduction of anæsthesia has made possible the full realisation for mankind of the value of their work.

The details of the birth of anæsthesia are not here our concern. Least of all is it necessary for us to enter into squabbles about priority or the allocation of merit. At any rate, it seems clear that Dr. Morton in the United States employed ether for inhalation by a patient undergoing a surgical operation, and that very shortly thereafter Sir James Simpson of Edinburgh, less than content with the action of ether, made a number of observations on himself and others which resulted in his discovery of the properties of chloroform, both for general surgery and in midwifery. There was thus a period of some two decades during which surgery was transformed, so far as the immediate features of operation were

concerned, by the inhalation of drugs which totally abolished all consciousness and sensibility to pain until the surgeon's work was completed. This was in itself a greater advance than all previous history could record. It is at this hour, and will remain to the end of time, one of the most beneficent discoveries of the human mind, but we must very clearly understand that it did not create modern surgery nor serve in any degree at all against the chief enemy of the surgeon.

It is true that anæsthesia in itself performs definite services for surgery beyond the abolition of the patient's immediate pain. It permits the surgeon to relieve many patients who would otherwise not consent to operation at all; it affords him the great boon of complete stillness on the part of the patient; it achieves the complete relaxation of muscles which—as, for instance, in dislocation—were violently contracting against any efforts to restore the bones to their proper relation. By making operation painless it permits the surgeon to look very differently upon the question of time: and though it has lately been shown that, as might be expected, the mere continuance of the inhalation of anæsthetics is of importance, since these substances are all poisons, yet the surgeon may now take one, two or three hours over his task, if necessary; whereas only a few minutes saw the end of human endurance in days gone by. Again, anæsthesia prevents the patient from dying of immediate shock, as sometimes he used to do when the first incision was made, and we may presume that his powers of resistance, if inflammation ensues, are less impaired by a painless than by a painful operation.

But when all these factors are taken into account,

the most serious matter of all remains practically untouched. It is difficult to draw trustworthy deductions from such records as are available of the influence of anæsthesia alone upon surgical mortality, but it is safe to assert that though those two decades were unlike anything in the past, they can have witnessed very little amelioration of results in surgery. The operation was performed, affording an utterly different spectacle and an utterly different experience for the patient, but surgical fever supervened just when it chose, as its custom had ever been. Inflammation, gangrene and secondary hæmorrhage were liable to follow, and did in fact follow the work of the most skilful. The death-rate was enormous. The range of operations could not be materially enlarged because the great risk remained. Patients, otherwise unable to face the knife, could give themselves the chance of operation when without it there was no chance at all. But no conscientious surgeon, knowing what so constantly followed his work, could operate except when operation was the patient's one chance.

It is doubtless true that if, in some case taken at random, our Listerian precautions were now omitted and the patient were merely left to himself, he would very likely recover without perhaps much more than some painful inflammation in the skin where the stitches had been passed through in closing the wound. But in the old days patients were not left to themselves, for what one patient had, soon all patients had. The great enemies of the surgeon were commonly distributed by him and his assistants with scrupulous fairness amongst all their patients. Our patient left to himself would very likely escape the inflammations most to be feared. As we shall shortly

see, microbes are not generated except from previous microbes, and previous microbes of the same species. Each surgical patient has to fear other patients. His danger is the danger of infection just precisely as if he were a healthy person lying in bed beside a sufferer from cholera or plague. In surgery as it was, the surgeons and the nurses were the most deadly enemies of their patients, once the deadly microbes made their appearance. So long as no patient harboured them, all was well, but once the infection made its appearance in a ward its habit was to spread until all the others were involved. Microbes are not insects and have no wings; they can move to some extent in fluids, but otherwise when they move it is because they are conveyed. To some limited extent they are conveyed by the air, but the more we learn the less importance we attach to air-borne infection. Air-borne usually means insect-borne, as we now know for malaria and yellow fever, and plague and sleeping-sickness. Surgical infections were conveyed mostly by fingers and sponges, and the conditions which obtained in surgical wards were similar to those which were to be found in Maternity Hospitals. The particular microbes most to be dreaded might be absent and then all was well, but if once they made their appearance in a single case, they were soon everywhere. That case was dressed and then the infection was systematically conveyed on sponges and fingers and the like to every other patient in the place. These conditions obtained in ordinary surgery; they obtained, it need hardly be said, in the surgery of war.

We may briefly describe as most typical the disease called pyæmia, which raged everywhere in the old days, but which has now become so uncommon

that the present writer, though he spent most of his time for several years in a great hospital containing hundreds of surgical beds, has never seen a case of the disease in his life. The word pyæmia means pus in the blood, and the external sign of the disease is the appearance of abscesses due to the formation of pus. When these abscesses appear they have to be opened, and it is this opening which gives the opportunity for infection to be conveyed from one person to another. If the material from such abscesses be examined under the microscope it is found that it contains large numbers of certain microbes called cocci, and it has been experimentally proved that these cocci are the cause of the disease. Pyæmia is a name of horror to the medical student of to-day; it is a recollection of horror to the doctor whose memory goes back a few decades; it has caused countless deaths for countless ages, but the nineteenth century saw the beginning of its end, and we speak of it and think of it now as we think of leprosy or plague in England, where once those diseases flourished and where they are now unknown. But if, through some universal madness, surgeons should decide to abandon Listerism, pyæmia would soon be raging in every surgical hospital in the land.

It is particularly to be noted that the surgery of the past was eminently destructive, in contrast with the conservative surgery of to-day. When inflammation supervened, as in a compound fracture, it commonly went from bad to worse. The essence of a compound as distinguished from a simple fracture is that it involves a continuous wound from the broken skin to the broken bone. In these circumstances inflammation appears and spreads upwards in various forms and by various routes.

For this in the old days there was but one remedy, the amputation of the limb in order to arrest the upward course of the inflammation. Soon thereafter symptoms of the malady would reappear, very often, in the stump, and a further operation, higher up, would be necessary. Evidently it was the mark of this surgery to be destructive. And, indeed, we may say that the surgeon's business in those days was to *remove*. Amputation, excision, ablation, always taking away was the surgeon's business. Every day he was called upon to deal with compound fractures where the patient had to choose between his limb and his life, with a very high chance indeed of losing both. For even when the broken limb had been removed, and even though the infection had been arrested, there was still the surgeon's wound to reckon with, and an inflammation set up therein might very well prove fatal.

But, as we shall abundantly see hereafter, modern surgery is essentially conservative. It becomes more and more possible to deal with inflammation wherever it is found and to control it without having recourse to the removal of the inflamed part, and this, of course, means everything when, as in the case of the brain, the inflamed part is vital. Large numbers of operations are daily performed where there is nothing taken away; where, indeed, on the other hand, there has been positive construction achieved by the surgeon. As for compound fractures, the conservatism of modern surgery expresses itself in an immensely diminished use of the knife and the saw, for it is often possible, by the application of our knowledge of the causes of inflammation, to arrest it at its site of origin, thus superseding not only the surgery of the past, but the earlier triumphs

of Listerism in the post-operative record of these very cases. For it will be evident from what has been said that, given the amputation in any given case, the Listerian surgeon will have better results, by which we mean fewer deaths; but to-day we witness the further triumph that the amputation itself can often be averted.

It is necessary to insist, further, on the question of pain as it is witnessed in modern surgery in comparison with the past. Generally speaking, the skin is the most sensitive to pain of any tissue or structure, and, as we have seen, the initial pain of the surgical incision is controlled not by Listerism but by anæsthesia. Acute and appalling though the pain of operation was, in the long run it would be far outdone, of old, by the patient's subsequent sufferings. Inflammation in greater or less degree was the normal sequel to operation, and pain is one of the characteristics of that condition. The ancients noted as the symptoms of inflammation *calor*, *rubor*, *tumor et dolor*—heat, redness, swelling, and pain.

Generally such pain is due to pressure. A nerve will send no messages until it be pressed upon, and then we are soon aware of it. The pressure of inflammation is due to the increased quantity of fluid in the part—there, as we now know, for therapeutic purposes, but painful nevertheless. A finger, the end of which is slightly inflamed, may hurt very little when held up in the air, but will begin to hurt severely if it is allowed to hang down; and the pain will probably be of a throbbing character, synchronous with the beating of the heart, every pulse of which raises the pressure upon the nerves in the already congested part. We are aware of the same fact in the throbbing headache that de-

pends upon congestion within the skull. There is too much fluid present within rigidly limited space, and the sensory nerves, being thus pressed upon, cause a headache. Since the pain of inflammation is chiefly due to pressure rather than to any chemical effect of the products of inflammation upon the nerve-endings, we can understand that the pain will be much worse when the tissue involved is one which cannot swell so as to relieve the pressure. Thus it is that a very slight pressure of intracranial congestion, such as would be unnoticeable elsewhere, may cause disabling headaches; and thus it also is that toothache is so painful, since here the inflammation is occurring in a tissue which is practically precluded from swelling at all. For the same reason the inflammatory processes that occur in bone are peculiarly painful, as only too many victims of accident knew in the bad old days.

Thus pre-Listerian surgery was most eminently painful surgery, for inflammation was its normal sequel, and though anæsthesia was a mighty boon, the worst was always yet to come. Beneficent though he might be, the surgeon was always the inflictor of pain, since time began until the seventies of last century. Nowadays, as we shall see, the surgeon is above all the enemy of inflammation, which is to say that he is the enemy of pain. His own procedures involve no pain, since the knife and the needle are used under anæsthesia, and no inflammation follows their use; and all manner of inflammations causing pain are successfully arrested by the surgeon's procedure. The surgeon's knife to-day inflicts no pain; it alleviates and prevents far more pain than the physician's drugs.

But if we are to understand the accomplishment

of Listerism we shall find it necessary briefly to review our modern knowledge of a certain most important group of living things, wholly unknown until the nineteenth century, without which the higher forms of life, including ourselves, could not exist, and yet which number amongst them our greatest foes and furnish the key to the control of nearly all forms of disease—most notably surgical inflammation. To these microbes, then, the following chapter must be devoted.

## CHAPTER III

### MICROBES

The name of microbes was given by Pasteur to the lowest of all living things, known to botanists—for they are plants—as the Schizomycetes or Fission-fungi. The name is an allusion to their method of reproduction, which is by simple fission or splitting. The vital significance of microbes depends, however, upon the fact not that they divide by fission, but that they are fungi. The essential character of a fungus is that it is a plant which does not contain chlorophyll. It is worth while to observe what this means, since it is the key to the mode of life of the fungi and to all that follows therefrom.

All plants whatever, the fungi excepted, contain either the green colouring matter called chlorophyll, or one of its modifications such as are found in marine plants. In virtue of their chlorophyll, plants are enabled, under the influence of sunlight, to feed upon the carbonic acid of the air or of water. The presence of chlorophyll means, therefore, that a plant can live on inorganic food. Given air, light, water and certain salts it is satisfied. In any theories we may entertain as to the first forms of life, we are bound to assume that these first forms possessed the essential characters of the green plant as we know it. They must have been able to feed upon inorganic food, since there was none other for them.

It follows that the fungi cannot be regarded as representatives of the earliest forms of life. They must have lost their chlorophyll or whatever discharged the function of chlorophyll in primitive times. They no longer possess the characteristic plant faculty of finding nourishment in the inorganic world. They are therefore compelled, like animals, to live upon materials which have been constructed by previous life. Upon that fact depends all that follows for us from the existence of the fungi. Here we may ignore the higher fungi, such as the mushrooms, and concern ourselves entirely with the microbes, far and away the most important of the fungi, the most useful and the most deadly, the most numerous, the most minute and the most recently known.

By far the greater number of microbes feed upon the organic matter of dead bodies from which the life has departed, or upon waste products—which cannot be said to have ever been alive—of living things. All microbes which have this mode of life are called saprophytes. They are, indeed, humble; they are doubtless to be classed as degenerate, but they fulfil a most important function in the world of life. Without them the surface of the earth would long ago have become a charnel house. Upon these microbes the existence of all the higher forms of life depends. Their function is to break up and destroy the dead bodies and the products of all other living things, restoring their chemical constituents to earth and air, whence they were originally wrested by the green plant; and whence, again and again, new green plants will wrest them. Without these saprophytes the cycle of life could not be maintained, and we who discuss them could

never have been evolved. Microbes are the great purifiers, the great scavengers, the great restorers of the world, and this they are because of that peculiar and, in a sense, degenerate mode of life which depends upon their loss of chlorophyll.

But certain forms of microbes have stepped across the line which divides the dead from the living. Their natural function, as we may say, is to disintegrate the bodies of the dead. They have, however, learnt, as we may suppose, in the course of the ages, to attack the bodies of the dying, and finally, in some instances, to invade and thrive in the bodies of the previously healthy. The saprophyte or liver upon the dead has now become a parasite or liver upon the living. Of the total number of microbes only very few are parasitic upon man, say less than three score all told, but they suffice to produce between them very nearly all the ills that flesh is heir to.

An important complexity is furnished by the fact that one and the same species of microbe may at one time live upon a living body, and at another time in some organic medium which, though the product of life, is not itself alive. Thus most of the microbes of disease can be cultivated in test-tubes containing beef jelly or milk. At such times they are of course mere saprophytes, but saprophytes with the faculty of becoming parasites. This adaptability is of high importance to us because, if a microbe cannot live outside the human body, the conditions of infection will be very different from those which obtain in the case of a microbe like the typhoid bacillus, for instance, which can spend a whole winter in the soil between leaving one host and infecting another. The microbe which has not the power of leading a saprophytic existence must be

conveyed immediately from one host to another if it is to survive; unless, indeed, we are to reckon with the "vie suspendue" or "vie ralentie"—illustrated by century-old seeds which can still germinate.

The term microbe is commonly restricted, though without etymological necessity, to the humble vegetable forms which we have been hitherto considering. But there is no particular reason why the term should not be extended to include other minute forms of life which are not vegetable. Such an extension would be convenient because it has been found in recent years that there are various minute animal cells which are capable of leading a parasitic existence after the fashion of certain microbes, and which give rise to disease in a similar fashion. Malaria, for instance, which causes more illness, though tuberculosis causes more deaths, than any other disease whatsoever, is due to the invasion of the body by a minute organism which is not vegetable but animal. Syphilis, again, which is one of the most important of all diseases, has lately been shown to be due to an animal parasite, and the same is true of sleeping-sickness. The surgeon, however, is much more nearly concerned, as a rule, with the vegetable microbes which were earlier discovered and which cause most of the conditions against which he fights.

Parasitism is one of the universal facts of the living world. Swift's lines about fleas and lesser fleas "and so *ad infinitum*" are nearly true. We observe the characters of some minute worm, and we find its blood constantly inhabited by parasites not by any means dissimilar from some of those which are apt to infest the blood of man. Though life be manifested in individuals, the whole of the

living world may almost be looked upon as a single organism which is but partly discontinuous. Every species that is evolved furnishes an environment, a home, a host and a feast, for some other species. Thus evolution takes a curious course. The production of the higher apes made possible the production of humble parasitic species which could live in their tissues but in those of no earlier animals. In similar fashion, though man is the highest product of evolution, he is not the latest—a point worthy of remembrance by those who suppose that evolution is synonymous with progress. The latest products of evolution are various microbic species which can live nowhere but in the tissues of man. It is plain that they must be of later origin than he is. At the same time, it is worth noting that observations made upon the anthropoid apes reveal our blood relationship with those species in a new and striking fashion, by showing that almost all, if not all, of the parasitic maladies formerly thought peculiar to man can be communicated to apes, though not to the lower monkeys nor to any other species.

If we survey parasitism as a whole, realising it to be a general fact of the living world, we shall expect it to obey the ordinary laws which govern the relations of species. Each species for itself is a law of life. Darwin long ago showed that it was impossible to find any instance where a species displayed any character for the sake of another species. Within the specific limit individuals live largely for each other, but physiological altruism never transcends this limit. It is true that species enter into mutual relations—in which each is concerned, however, wholly for its own advantage. The best instance of such symbiosis, as it is called,

is the lichen, which is constituted by an alga and a fungus, each living for itself, but each deriving advantage from the other. Vastly more common than symbiosis, however, which is only exceptional, is parasitism, and if we remember that, according to the principles already laid down, the parasite is seeking only its own advantage, we shall be prepared to observe evil consequences to the host in not a few cases. These evil consequences constitute the greater part of what we call disease, whether we find it in man or in the lower animals or in the vegetable world.

Not all parasitism, however, involves the disease of the host. It is indeed to the best interest of the parasite that the host shall not be killed, for if that occurs the parasite usually succumbs also. It is probably true that all living species, except the most minute, are the hosts of parasites which do them no appreciable harm. These parasites are found upon the surface of the body and within its tissues. One species of bacillus has been found in the bowel of a baby as early as eleven days after birth, and is to be found in every human bowel throughout life. There appear to be some thirty kinds of microbe which must be reckoned as more or less normal inhabitants of the human mouth alone. No cleanliness, whether internal or external, will entirely purge us of these guests. But it is only under certain conditions that this universal fact of parasitism becomes of urgent moment to the host. Perhaps there gains admission to his body a form of parasite with which no vital equilibrium can be established and which multiplies to such an extent that his life is destroyed, or is perhaps saved after a battle which he calls, it may be, an attack of pneumonia

or typhoid fever. In other cases, a condition of equilibrium perhaps long existing is disturbed. The parasite which has been harboured in moderate numbers, presumably, for any length of time, begins for some reason or other to multiply, and consequences may follow similar to those which followed the introduction of an entirely new parasite. The microbe of pneumonia, for instance, appears to be a practically normal inhabitant of many mouths and throats, especially of those who attend cases of the disease. But it is only when some unknown factor is disturbed in the vital economy of the person who harbours the microbe, or when some too well-known ally, such as alcohol, is freely introduced, that he in his turn is really infected by the disease. Such facts as these suggest to us the existence of those problems of immunity and susceptibility and their possible control by man which have recently begun to play a most important part in surgery. Thus, to take an instance, a person who suffers from the formation of little swellings in the eyelids may be relieved either by surgery in the ordinary sense of the word, that is, by the performance of a Listerian operation—which may, however, have to be repeated indefinitely; or, on the other hand, the tendency to the production of these swellings may be entirely arrested by the introduction into his blood of a substance called anti-staphylococcus serum which is derived from the coccus or microbe that causes the swellings, and so modifies the patient's body that this particular coccus, though it may still visit his eye, can do no harm there. Such a procedure may be called medical, perhaps, rather than surgical, but it is the treatment of what is ordinarily called a surgical disease, and

it depends upon principles which were largely elucidated by the greatest surgeon of all time. To this subject we shall perforce return.

The foregoing, considered as a whole, throws an unexpected light upon a proposition which contains a measure of truth and is frequently exploited by cranks even at the present day. It is that man alone is subject to disease and that this is the fruit of his misconduct. If, therefore, he will only lead the "simple life," or avoid certain errors, such as, shall we say, the cooking of his food or the eating of flesh, he will find himself as free from disease as his humbler but wiser relatives.

Now it is impossible to question that men's habits do often subject them to disease which the lower animals avoid. The modern surgeon knows, for instance, that, as we shall see in a later chapter, alcohol lowers the resistance to infection, and so increases the risk that his patient may suffer from inflammation. But though there are many instances such as this, it will be seen that disease due to parasitism is really a general factor of the life of the world, and can no longer be laid entirely at the door of man's imprudence or folly. The lower animals suffer very largely as we do; they have their own specific diseases as we have ours; and often we find, as in the case of glanders, that the disease of the horse may very easily become the disease of the ostler. As for the ordinary cocci of surgical inflammation, they are very adaptable and will thrive in the wounds of many of the lower animals as readily as in those of man. The propositions of our faddist reformers must therefore be accepted with caution. Most human maladies are consequences of the general factors of parasitism, which produces pre-

cisely similar consequences in other species. A man's habits in regard to cleanliness and eating and drinking are important in many connections, not least of all in connection with disease; but it is impossible to declare that they are all-important or indeed anything like as important as many ardent advocates of personal hygiene are apt to assert. In the matter of malaria, for instance, the secret of health is *not to be bitten* by the mosquito which conveys the parasite. In the matter of plague the secret of health is to be found in no semi-ritual observance but simply in *not being bitten* by a flea which has previously bitten and been infected by a rat suffering from the disease. Instances might be multiplied indefinitely, and the lessons taught us are very clear and precise. The problem of disease must be looked upon as primarily a biological one. The greater part of disease is a problem in the relations between living species. Man and the lower animals are equally involved in these questions. It is not *primarily* a question of right-doing or wrong-doing except in so far as it is a question of right-doing and wrong-doing at the present day to acquaint ourselves with the laws of disease and to act accordingly. Where the bacillus of plague exists, together with the black rat which is susceptible to that disease, and which has fortunately been driven out of our land by the susceptible but non-domestic brown rat, there plague will occur quite independently of morality or of Providence. The plague bacillus has to live its life, and its first business is to find food; as is the first business of man. The rat flea, also, has to live its life, and its first business also is to find food. Man is simply one of the species concerned.

In the foregoing case and in many others man derives the infection from one of the lower animals, but the infection may just as easily go the other way. It has been seen that the anthropoid apes are subject to many forms of human disease in consequence of their close affinity with mankind. That explains why a glass screen is interposed at the Zoological Gardens in London between the visitors and the anthropoid apes, though none such is necessary in the ordinary monkey-house. We have found that the death-rate amongst the apes from tuberculosis and influenza has been greatly diminished since the interposition of this screen has protected them from infection by the visitors.

The moral of this chapter will now be clear. It is that the moralist must be cautious in his pronouncements upon the subject of disease. When he finds that the chief of human diseases, tuberculosis, is also found not merely in apes and monkeys but in four-footed beasts and fish and fowl; when he finds, also, that wounds in almost any of these creatures are liable to disastrous invasion by one and the same kind of microbe, he will more and more come to regard disease as a natural phenomenon due to natural causes, and none other, indeed, than in the majority of cases a manifestation of the struggle for existence as that struggle occurs between different living species.

The investigation of these subjects is not impious, even though it takes little concern of Providence, even though it tends more and more to assimilate man and his conditions to the rest of the living world.

Further, the elucidation of the causes of disease benefits not only man, but also all those forms of

life which he takes under his care. Pasteur and Lister are the friends of the dog and the horse, no less than the friends of man. There is much for the moralist to inculcate, even though we qualify in some degree the enthusiastic assertion that regular and simple modes of life will protect from all disease. It remains to be taught that it is part of true morality fearlessly to investigate these matters and to act upon the knowledge thus obtained.

Finally, it is important for us clearly to realise the definiteness of microbic life and its obedience to the laws which are exemplified in all higher forms of life. In the first place, microbes are the descendants of previous microbes just as certainly as human beings are the descendants of previous human beings. They are no more generated out of any kind of material than we are. If microbes are found in any part of the human body—as, for instance, in a wound made by a bullet or a surgeon—they have certainly been conveyed there. They are neither generated spontaneously from dead matter, so far as we know, nor are they derived from the tissues of any living creature in whom they may be found. The whole theory and practice of surgery and preventive medicine would be different if the facts were otherwise. I am by no means here prepared to assert that what is called spontaneous generation of life does not occur, but it certainly does not occur so far as the surgeon and the hygienist are concerned. The objects of their attention are members of definite living races, obeying the general law *omnis cellula e cellula*—every cell from a cell. If the surgeon finds such and such an organism in a wound made by him, he knows that he or his assistants put it there. It

did not "happen there"; it was not generated from the patient's tissues nor from the exudation into the wound. It has as definitely to be accounted for there as if he had found a butterfly or a halfpenny in its place.

Further, these races, though subject to variation and modification, like other living races, are nevertheless definite and distinct. It is not microbes in general that the surgeon has to fear. It is true that microbes are to be found everywhere; they are to some extent in the air; they are to be found on every surface. Lister asked the surgeon to act as if everything around him were covered with wet green paint and must be avoided. Everything is indeed covered with microbes, and should therefore on general principles be avoided. But the microbes which we have to fear are by no means ubiquitous, and wherever we find them they are derived from previous microbes of the same species. The laws of heredity obtain here as elsewhere. If a virulent inflammation develops in a surgeon's patient, and is shown to be due to a definite microbe, and if he has lately been attending another patient in whom that same species of microbe is multiplying, the chances are quite as high as need be that he carried it, perhaps under his finger nails or in his beard, from one patient to the other. We are dealing with things so minute that the naked eye cannot see them, but they are just as real, and the laws of their multiplication and dissemination just as definite, as if they were African elephants. It is a first principle in modern surgery and hygiene that all microbes have to be accounted for, and they have to be accounted for just as if they were individuals of higher races.

The foregoing summarises as fairly as may be our present knowledge of this subject—knowledge most of it familiar to all of us. In the next chapter we shall learn something incidentally of the history of its attainment.

## CHAPTER IV

### PASTEUR THE FORERUNNER

No great man stands alone. Necessary though he be, unique, solitary, and indispensable, he is yet a social product, a son of Man, and in his voice the immortal dead yet speak. The affiliation is sometimes definite, sometimes obscure. We know that the genius of Bach is to be heard no less in Delius than in Beethoven; and that Galileo and Kepler served for Newton to raise his eyes upon. In other cases a genius appears to arise by spontaneous generation; as we used to fancy, until the other day, of the great Athenian age. But even there, as we now know, we are witnessing not a beginning but an efflorescence, of which the root and stalk are slowly being disclosed by modern archæology.

In the case of modern surgery, the immediate creation of Lord Lister, all men should know that the forerunner was Louis Pasteur, the greatest benefactor of mankind in recorded time: to whom not only modern surgery owes its prime genesis, but also preventive medicine—and such curative medicine as may still be necessary in the future.

In the last chapter we surveyed, in general outline, our modern knowledge of microbes—or micro-organisms, in the quite unnecessary modern version of Pasteur's term. We must now trace, with equal brevity, the main steps by which the revelation

was obtained, and its application to the chief needs of man effected.

The cell-theory of the structure of living things was the first achievement. Schleiden and Schwann showed, first in plants, and then in animals, that the body of a living being is made up of cells. It did not take long for the microscopist to discover that yeast is a living thing, made up, like all others, of living cells. Yeast is indeed a unicellular vegetable organism; and though of higher organisation than the bacteria, it is also a fungus. It is not one of the fission-fungi, however, but effects its reproduction by a process of budding or gemmation, the buds becoming detached from the mother cell and living independent lives without her actual disappearance, as in the case of the microbe that splits into two. Nor is yeast directly a cause of any disease of ours, though in some cases of dyspepsia, when the stomach fails to produce in adequate degree the hydrochloric acid which is at once a digestive agent and a powerful antiseptic wherein few fungi can live, the yeast plant may be found in the gastric contents. Indirectly, of course, the yeast plant is of high importance in pathology, as its particular toxin, ethyl-alcohol, which it produces by the fermentation of sugar, is a leading cause of tissue-degradation and disease.

But it is just because the yeast plant effects a fermentation that it is of such interest to us and our present narrative. Fermentation, from whatever point of view it be considered, is one of the most important words in the dictionary, and whatever throws light upon it illuminates the central problem of biology, which is the nature of life. That we now realise, but the first step towards our modern point

of view was taken when it was found that a living cell causes fermentation. The accepted view was that fermentation is caused by some chemical agent, not alive, which is called a ferment, and which effects chemical changes of certain kinds without itself being changed or consumed. That view is also the present view, but with a notable difference. For the discovery of the life of the yeast plant plainly led to the view that fermentation is a vital phenomenon, as distinguished from a chemical one.

We now know that fermentation may be both a vital and a chemical phenomenon. We have lately done what Liebig and Pasteur and the great disputants of those days could not do, and have been able to extract from within the body of the yeast plant the ferment, or series of ferments, by which it does its work. Those ferments are not themselves alive, and will effect their characteristic results in the absence of all life ; and thus the chemical theory of fermentation, upheld most notably by the illustrious Liebig, is justified. But evidently it remains of no less importance that these ferments are produced in the body and by the life of a living thing.

Though fermentation can be effected apart from life, whether by ferments made by living things, or by other agents such as platinum in a certain state of subdivision, and though the study of fermentation apart from life has the extraordinary importance that it promises to elucidate the nature of life itself, which may depend upon a sequence of fermentations, yet for our purposes it suffices simply to accept the notable fact that yeast, the fermenter of sugar, is a minute living plant. From that discovery we can proceed far.

The fermentation of sugar by the yeast plant is of

practical importance because the production of alcoholic liquors depends upon it. The wine and brewing industries merely apply the science of fermentation; and if one wine or beer differs from another, it is a difference of fermentation that will be found. Further, the fermentation requires to be directed and controlled; and, as was soon found, not yeast alone is concerned with the making of such complex products as wine or beer. To take only one case, the alcohol produced by yeast is itself subject to fermentation, and may be converted into acetic acid, this being the essential change by which wine becomes vinegar. This change, as we now know, is effected by a microbe, known as the *bacillus aceticus*, which is unique among living things in that it feeds upon alcohol—by breaking it up, however—normally and profitably, that being its appointed diet.

We may now turn towards the figure of the young Pasteur, who was destined, beyond all other men, to throw light upon this subject and, by championing the vital theory of fermentation (though that, as we have seen, is not really opposed to the chemical theory), to found the modern sciences of pathology, medicine, surgery, and hygiene.

This greatest doctor of all time never passed an examination in medicine, but was destined to be a chemist. From the very first he distinguished himself in chemical research, and turned from the accustomed paths towards the undiscovered land which he was to chart, only against the wishes and warnings of his distinguished teachers, Dumas and Biot, who feared that the promising boy might lose his way.

But his first piece of independent research foreshadowed the direction in which he was thereafter to

go, and is well worth recalling here for its own interest and for its bearing upon our subject. Briefly, the facts which the young chemist served to elucidate are these. Ordinary tartaric acid has no influence upon a ray of light passed through it, though that ray has previously been "polarised," so that all its vibrations are in one direction only and will reveal any influence upon that direction. But there are other forms of tartaric acid which are "optically active," as chemists say, in that one of them is "dextro-rotatory," rotating a ray of polarised light to the right, whereas the other is "lævo-rotatory," rotating the ray to the left. Now the optically inert acid really consists of a mixture of the two active acids in such a proportion that they exactly neutralise each other's action, and permit the ray of polarised light to emerge from a solution of them in the same plane as that in which it entered. Under certain conditions the inert acid can be made active, because one of the constituents is destroyed by the growth of a bacillus, and the other, which the bacillus does not touch, is left behind, and exerts its optical properties unantagonised. This remarkable discovery of Pasteur's leads us to realise that the molecule of tartaric acid may exist in two forms, exactly identical save that one is, so to say, the mirror image of the other; differing, in other words, as a right hand does from a left; and this fact enables us to found and prosecute a "chemistry in space" or stereo-chemistry (that is, "solid chemistry"), which studies the molecule in its three dimensions and is now achieving undreamed-of triumphs. This new chemistry, of which the great representative, lately dead, was the Dutchman, van't Hoff, finds its starting-place in Pasteur's observations upon tartaric acid; and his

name should be borne in mind and in grateful remembrance whenever stereo-chemical theory guides the expert in the synthesis or creation of valuable new compounds, such as Professor Ehrlich's invaluable compound of arsenic, called Salvarsan or "606," or any of the recent valuable hypnotic or antiseptic drugs. It may make all the difference in the world, or rather, in the body, that a compound is built up on a left-handed rather than a right-handed plan, and once we realise that our vital processes are a series of fermentations, and that one and the same ferment may destroy a right handed-compound and leave its mirror-image untouched, as Pasteur showed, we shall be able to appreciate the therapeutic possibilities of stereo-chemistry at their due worth.

But now let us consider the more immediate significance of these matters. They show us that fermentation may be due to the growth and life and chemical activity of a bacillus. It is not the air that causes fermentation, though the process may be arrested in materials from which air is excluded. The exposure to air is really exposure to microbic infection, and the fermentation follows. If air be necessary for fermentation it is because air is necessary for the growth of most microbes, but it is the microbes and not the air that are really responsible.

Pasteur very carefully studied this subject and showed that, whilst all microbes, like all living things, require oxygen for the purpose of respiration, some obtain it from the air, whereas others cannot live in the presence of air but obtain their oxygen from their food—the oxygen-containing compounds which they split up in the course of their lives. The air-needing microbes he called aërobic, and the others anaërobic. The former will grow most abundantly upon the

surface of any culture-medium, whereas the latter will only grow at some distance beneath the surface. A typical instance of the anaërobic bacteria is the bacillus of tetanus or lock-jaw, which grows in the soil, and may thus infect any chance wound in the hand of a gardener—without relevance to whether or not the wound be in the space between the thumb and first finger, as is popularly supposed. But the great majority of wounds infected with soil fail to give rise to tetanus because the microbe, disliking the air, flourishes only several inches below the surface.

Into the great controversy regarding the nature of fermentation which followed the initial observations, there also entered the question of "spontaneous generation," or the possible origin of living forms, *de novo*, in not living materials. Pasteur and those who worked with him showed that certain conditions, such as destroyed life, or made its presence impossible, prevented the occurrence of fermentation even in the most fermentable materials, no matter whether they were favourably situated otherwise or not. They might be kept at suitable temperatures, and might be separated from the air only by a mere plug of cotton-wool, which freely admits the air but allows the passage of no microbes; in either case the material would not ferment if it had previously been boiled or otherwise treated so as to destroy all the living microbes within it. Plainly, therefore, it was not the air and the warmth, nor both together, but the microbes which commonly gain access from the air to putrefying or fermenting materials, that are the *vera causa* of the phenomena.

The bearing of these fundamental experiments upon the problem of spontaneous generation is evident. The materials deprived of life, or sterilised,

as we now say, remained so indefinitely, provided that no new life could gain access to them : and this was so no matter how suitable for the composition or generation of living beings these materials might be. The controversy regarding spontaneous generation is not in the judgment of the present writer by any means closed, but these facts observed by Pasteur evidently bear upon it.

Of course a great deal was learnt, in the course of this controversy, regarding the vital conditions of microbes. Only by experiment can we ascertain what temperatures microbes will survive, or succumb to, and what chemical substances, in what proportions, will arrest their growth, and so act as preservatives of fermentable materials, or, to use the modern term, as antiseptics. It was in the course of this work that Pasteur discovered the method of sterilising milk which is now known as pasteurisation, and consists in the prolonged employment of a less degree of heat than will be effective if used for only a short time.

There followed that which will ere long abolish the chief evils of man's physical life. The chemist that was, the student of beer and silkworms, became the revealer of the causes of most disease. His first triumph in this direction was the discovery of the anthrax bacillus, and the proof that it is the veritable cause of the disease. All subsequent bacteriology builds upon the foundations laid by this incomparable pioneer : and all bacteriology yet to come.

His magnificent researches into hydrophobia, in which one complexity after another was successfully unravelled, enabled him to provide a remedy for that terrible disease, though the microscope and even the ultra-microscope have hitherto failed to

reveal the form of the living organism which causes it. Much more important were the indirect and subsequent revelations involved in this and similar researches; for the master had not only identified and convicted the causes of disease, but had thrown light upon those vital interactions between host and parasite upon which all the facts of immunity and susceptibility, including the daily miracle of natural recovery from infectious disease, depend. Further, he showed how these processes involve notable influences upon the microbes concerned, so that their virulence can be enhanced or attenuated by passage through the bodies of highly susceptible or highly refractory hosts. From these initial inquiries have proceeded the recent researches to which we owe the antitoxin of diphtheria, inoculation against plague and typhoid, the serum treatment of tetanus and cerebro-spinal meningitis ("spotted fever"), and also the various microbic preparations now found to be of value in the treatment of so-called "surgical diseases."

"It is in the power of man," said Pasteur, "to make all parasitic diseases disappear from the earth"; and the time has already come when we may say that the words are being justified. The parasitic diseases *are* being made to disappear from the earth, and the twentieth century will substantially achieve the consummation devoutly to be wished, for which the nineteenth and Louis Pasteur above all other men provided that knowledge which is power. Since Pasteur's time the tropical diseases have been investigated on his lines, and their extermination waits upon human volition alone. We understand and can control cholera and plague, malaria and yellow-fever and sleeping-sickness. Pasteur's greatest pupil,

Robert Koch, found the tubercle bacillus in 1881, a date which therefore marks the beginning of the end of the most deadly of all diseases. At the other end of the scale, one may obtain relief from even the "common cold," by means of an appropriate serum —not to mention the surgeon's possibilities in remedying the nasal errors which encourage the *micrococcus catarrhalis*. There is no end whatever to the services present and to come of this saviour of mankind. In future chapters we devote ourselves to one only of them: one only, yet, through the work of Lord Lister, a boon to countless millions.

Here, therefore, we must leave this great spirit. His memory is kept green in Paris by the Pasteur Institute, where the cure of hydrophobia is insignificant compared with its ever-increasing contributions to our knowledge regarding and control over disease. As we have seen, the French people know something of his greatness, and they have reason. As someone has said, not even Pasteur himself could restore to his countrymen the cubit which, according to the inevitable laws of heredity and selection, was lopped off their stature by the Napoleonic campaigns. Nor can the disastrous consequences of war, to conquerors as well as to conquered, be more forcibly stated than by saying that not even a Pasteur could remedy them. But, as Huxley pointed out, his economic services, not in the matter of the vital industry, which is the making of men, but to the silk trade and so forth, sufficed alone to pay the entire indemnity of the Franco-Prussian war. So stated, that was much: relatively to the whole, it was nothing.

We see in Louis Pasteur the perfect type and figure of that intellectual passion which is re-creating the world. He was a devout Catholic, the solitary pre-

eminent student of nature whom that faith has contributed to the world in three centuries. His was a Catholicism universal indeed; not in local manifestations alone did he see the wonderful, but everywhere: "Tout est miracle," was his verdict. That may easily and lightly be said by those who have thrown no light upon any natural event, and to whom everything is miracle on the familiar principle, *omne ignotum pro magnifico*. But the words mean something on the lips of a Pasteur. For consider: We may say that the facts of disease and death were brought by him from the realm of the supernatural and miraculous into the realm of the natural and therefore, as the fool hath said in his heart, the non-miraculous. Disease and death were the great mysteries, where the occult held sway. The malign and mysterious influence of the moon caused lunacy; there was the evil eye with its morbific powers; in fever and in epilepsy the body was possessed by demons, for the expulsion of which Pasteur's Church still trains exorcists; tuberculosis was the "King's Evil," to be cured by the "sovereign touch," wherewith the descendant or representative of Deity could heal. Far more than all other men, Pasteur abolished for ever these superstitions, and gave us natural ideas of disease, essentially simple, intelligible, convincing to common sense, capable of logical demonstration. When such a man taught that all is miracle, natural and therefore divine, we may do well to take heed.

His passion was for knowledge and its beneficent power. "Il faut travailler," was his favourite phrase, and the motives behind it were as pure and high as human motives can be. Here was the primary secret of his greatness: and the second was the patient, faithful, subtle, inexhaustible intellect which framed

hypotheses and tested them, with equal fertility and accuracy and resource.

Only once in many generations does Life produce a Pasteur. Not by wishing, nor by trying, can any of us emulate him: not yet, if ever, can Eugenics indicate or control the immeasurable complexities of biological law which are involved in the genesis of genius such as his: nor is there any school of science, though its income were a million pounds a minute, which can produce a Pasteur by the cunning of its curriculum and the alchemy of its professors. But if we cannot make ourselves into Pasteurs, nor breed such as he, nor transmute spirits of clay into spirits of light in any of our laboratories, at least we can revere and follow according to our power the few supreme men of genius who make the progress of the world. At least we can vow, here and now, that we will worship no more false gods who

> "Gather and squander, are raised
> Aloft, are hurl'd in the dust,
> Striving blindly, achieving
> Nothing,"

and that, in so far as we can, we will make available, for mankind, the work of these great ones, and will do our utmost to discover and to aid, instead of flouting and deriding, their successors, when and where they may appear.

To Pasteur, it seems to me, we may most justly apply the noble words written by Matthew Arnold to his father. For his, indeed, was one of those

> "souls tempered with fire,
> Fervent, heroic, and good,
> Helpers and friends of mankind."

And of the few like him may we say :

> " Ye fill up the gaps in our files,
> Strengthen the wavering line,
> Stablish, continue our march,
> On, to the bound of the waste,
> On, to the City of God."

## CHAPTER V

### LISTER INTERVENES

Pasteur, as we have seen, was a chemist and bacteriologist, not a physician or surgeon, though he is the father of all physicians and surgeons worthy of the name to-day. His great initial achievement, upon which all his contributions to disease ultimately depended, was the proof that fermentation is due to the presence in the fermenting material of certain living microbes. Fermentation was his problem, and he solved it.

Now the surgeon's problem was inflammation, as we have already seen. Everywhere it appeared in his handiwork, and thwarted his best efforts; everywhere the imminent certainty of it forbade him to use the knife except as a desperate remedy, and scarcely even as a desperate remedy for any malady within the skull or chest or abdomen. Everywhere inflammation appeared in wounds made by accident, whenever those wounds communicated with the surface, and in such cases the surgeon could amputate, or attempt to drain the inflammatory products, but failure dogged his steps, and even his heroic and desperate amputations, necessitated by inflammation, were followed by it, and the life went the way of the limb. The new era waited for one revelation only—the nature of inflammation. Given the solution of that problem, with the consequent

control of the surgeon's great enemy, and all modern surgery is made possible. The need was not for a chirurgeon or manual labourer (of however high a type), but for a pathologist.

That pathologist was found in the young surgeon, Joseph Lister, who obtained his first medical qualification in the fifties of last century. Here was a reader and a thinker, not impotent to perceive analogies, and Pasteur's revelation of the microbic origin of fermentation set Lister speculating whether, perchance, inflammation also might not be a process of fermentation, set up in living tissues by microbes. For if this were so, the microbes might be excluded or killed, and inflammation averted. Such was Lister's idea; but "he discovers who proves," and Lister proved.

This is not the place for a technical account of those splendid researches upon which modern surgical practice reposes. The papers containing them were collected and reprinted a few years ago in commemoration of the jubilee anniversary of Lord Lister's entry into the medical profession. Our concern here is to gain some understanding, as we have it to-day, of the processes of inflammation, which introduce us to some of the most romantic and miraculous accomplishments of the body, such as only a Maeterlinck could adequately describe.

If we cut a piece of wood or paper or a lifeless body, the cut remains. But one of the powers which living things have acquired, under the control of natural selection, is the power of repair—which, in lower forms of life, may amount to complete regeneration of a lost member. Our bodies are incapable of reproducing an amputated limb, nay, more, of reproducing a single sweat-gland or hair-

follicle in a damaged piece of skin. Regenerate they cannot ; and it is deeply interesting to the evolutionist to consider the complete loss of this power in the highest forms of animal life. But repair they can, and the process is a remarkable and beautiful one. No matter where the site, the body can only produce scar-tissue or its equivalent, whether in the skin or in the brain or anywhere else ; but that tissue, though incapable of exercising any but the mechanical function of repairing the bodily continuity, is invaluable in that capacity. If we are to live our lives outside of glass cases we imperatively require this power of repair ; and even in such a case, the internal injury done by a rough particle of food would demand the power of repair if we were to maintain our lives.

This inherent power it is, of course, that the surgeon depends upon. Ambrose Paré, the great French surgeon of the sixteenth century, who introduced the use of the ligature to tie cut arteries, said of one of his successful cases, " I dressed his wounds, God healed him." And to-day the surgeon who dresses wounds and who daily and unconcernedly makes them, depends upon the *vis medicatrix Naturæ* for the process of repair. Without this power there could be no surgery—not even the simplest amputation nor the withdrawal of a tooth.

The process of repair, unhampered by vicious influences, is simple, rapid, and painless. Those vicious influences are chiefly the microbes of inflammation, as we shall duly see ; but first we must note that, Listerism or no Listerism, microbes or no microbes, repair is a vital process which depends upon the health of the living cells involved, and cannot be successfully effected if they fail. Thus,

for instance, modern surgery knows that the degeneration of the tissues produced by alcoholism interferes with the reparative process, and that the administration of alcohol during repair also retards and imperils it. Also the surgeon may decline to operate, in such cases as those of diabetes, because he knows that, even though he excludes all microbes from his wound, it may not heal. The patient's tissues are vitiated by the abnormal chemistry of his body, and they cannot be counted upon to perform their indispensable share of the operation, however perfectly the surgeon performs his.

Again, there is the remarkable peculiarity of the body chemistry which is known as hæmophilia or the "bleeding disease." We classify it amongst diseases of the blood, but we do not yet know its pathology. Its characteristic is that the normal power of the blood to arrest bleeding—the "natural arrest of hæmorrhage"—is absent in hæmophilic persons. There may be some peculiarity in the body-chemistry of the salts of calcium or lime, which are necessary for the formation of the fibrin-ferment, that is produced in the blood when a vessel is damaged, and ferments "fibrinogen," one of the blood proteins, in such a way as to solidify it and cause the blood to clot. This is part of the process of repair, and without it there could be no surgery, nor mankind.

In hæmophilia the slightest rupture of a tiny vessel, as may happen, say, in a sharp movement of the knee, will fill that joint with blood: the extraction of a tooth, or even a violent sneeze, may lead to a fatal hæmorrhage. In such cases the surgeon will not operate; nor has much success followed the administration of certain salts of lime before pro-

posed operation on hæmophilic patients. The case concerns us here only because it illustrates the point that what surgery, at its highest, does, is to provide good conditions for the body's own processes of repair and defence. In hæmophilia one of these is inherently absent, and the only way of dealing with this extraordinarily interesting and instructive, but tragic, malady is to apply to it the principles of what I have called "negative eugenics," forbidding parenthood to those who suffer from, *or can transmit*, the defect. Hæmophilia is not only unique in its hereditary bearing upon the possibility of surgery, but it is also a striking illustration of the Mendelian law amongst ourselves. The defect is "dominant," as Mendel taught us to say, in males, and "recessive" in females. Thus the daughters of a hæmophilic man will be normal, as individuals, but yet abnormal as parents, for the effect will reappear in their sons. It is a crime to bring such sons, or daughters who may bear such sons, into the world.

Apart from such cases, we count on easy, certain, rapid repair, or "healing by first intention," in wounds which have a fair chance. We take it for granted, a mere commonplace, that the gap in the skin when we have cleanly cut a finger will be filled by something poured into it from the neighbouring tissues, that young blood-vessels will push their way into this material, and that the cells of the surface will multiply and go gaily to meet each other from either side over this foundation. There is just the very slightest increase of blood in the site of repair, and it may swell inappreciably, and perhaps during part of the time it may feel ticklish, but that is all. And if the edges of the wound have been suitably apposed and the knife has made a clean cut, only the

narrowest of lines will remain to record the extraordinary feat, as it really is, which was so easily accomplished.

But in too many cases the healing does not thus proceed. The wound becomes inflamed. That is to say, it becomes swollen, red, hot, painful. There is destruction of tissue, or of something else—as we shall see—so that the wound discharges or festers. A whitlow may illustrate the process for any of us at any time. This is inflammation, and this, as Lister, reasoning and observing from the work of Pasteur on fermentation, finally showed, is due to the attacks of microbes upon the tissues. First let us consider how far the analogy is now seen to be a real identity; and secondly, let us endeavour to understand the meaning of inflammation, thus interpreted.

First, then, we have learnt, in more recent years, that just as the yeast-cell exercises its power by a not-living ferment which it produces, so also the microbes of inflammation produce their effects not at all by their mere mechanical presence in the wound, but by means of the substances they produce. These we commonly call toxins or poisons, and they are of various composition, differing, indeed, with every kind of microbe. But many of them have now been proved to be definitely ferments, as much as the pepsin of the stomach, or the active agent of the yeast-cell, is a ferment. The analogy or parallel between fermentation occurring in lifeless material, and inflammation occurring in the living body, is therefore more than an analogy or parallel; and the Listerian suspicion is more justified even than the success of Listerian methods could ever prove. For just as the vital theory of fermentation

proves to be not antagonistic to the chemical theory, since the vital agents effect fermentation by the production of chemical ferments, so the phenomena of inflammation are seen not merely to be due to microbes as fermentation is, but are actually proved to be due to fermentation in the strictest chemical sense of that term. Certain of the facts of inflammation are simply facts of fermentation, as when we find that many materials in the wound are digested, that is to say, fermented, and dissolved by the microbic ferments, and contribute to the discharge. The case, then, is definitely proved, and we recognise in inflammation, whether of a wound, or of the lungs, or of the appendix, or where we please, a process the essence of which is fermentation started by the chemical ferments produced by living microbes. And once this be proved—nay, more, once it be even suspected—plainly the surgeon must seek to destroy and to exclude microbes, as Lister proceeded to do.

But now let us endeavour to interpret inflammation with this key. The phenomena are more than we observe in a fermenting fluid. The process is occurring in a living tissue, and though that tissue may be dissolved, and even be warmed, though even gases may be produced in it, there is more to be said. The heat and the redness and the swelling (not to mention the pain) are more than can thus be accounted for. They are due to the enormous access of blood to the inflamed part. Why this access? It is in order to repel and destroy the microbes. In other words, inflammation is a symptom not of death but of life, it makes for health, it is a vital stand made by the body for its safety, it is not a disease but a struggle against disease. *Given the*

*attack*, only the defence can save us, and inflammation is that vital defence. The attack may be so severe, the intoxication and fermentation and absorption of the products so acute, that the patient may succumb without having been able to summon inflammation to his aid, as in what has sometimes been called fulminating—lightning-like—appendicitis; had inflammation occurred it might have saved him.

Here is a paradoxical and revolutionary conception, which turns all previous assumptions upside-down, and which by no means all even of those whose business it is to treat inflammation have yet realised. For consider one of its corollaries. During the course of inflammation the patient's temperature is commonly raised; alas for him if it falls low when it should rise. In other words, fever is a symptom of inflammation. Now we think of fever as an illness, an evil, a thing to be counteracted. And so it may be that we give drugs like antipyrin and acetanilid and their allies—rank poisons one and all—so as to reduce the fever; which they do, but anon the patient dies. Our maltreatment of the case has been due to our misconception of the facts before us; bad practice has followed from bad theory. And though practitioners have given up prescribing these powerful and noxious drugs, which were hailed with such delight on their introduction a generation or less ago, they still abundantly prescribe alcohol for inflammation—as, for instance, in pneumonia—supposing that its effect upon fever is beneficial to the patient, though it is indeed precisely the reverse. For there are two ways of lowering fever, which differ as light from darkness, one being the way of life and the other the way of death. We may kill, or wash away, or neutralise the agents of, the microbes

which are attacking us; or we may paralyse the defence, of which fever is a symptom.

But the local phenomena of inflammation demand further attention; for they are of high interest and beauty in themselves; they require to be understood if the surgeon's treatment of it is to be understood; and of course he has abundant occasion to treat it, though he no longer initiates it now that Lister has provided him with the key to its causation.

A common and characteristic phenomenon of inflammation is the formation of a creamy fluid called pus, the microscopic and chemical composition of which is of extraordinary interest. Chemically it consists, if we could completely analyse it, of the microbic products or ferments, of the fermented, dissolved or digested substances of the attacked part, and also of certain chemical substances formed in the body and designed to destroy or devitalise the microbes, or to neutralise or split up their ferments or toxins. Naturally enough, the chemical study of this subject is immensely difficult; and the facts vary in almost infinite degree, not merely according to the species but according to the particular strain of microbes present. They may not even be the same for any two patients; but the foregoing is the outline of them. As might be expected, this mixture is poisonous, sometimes intensely so, and the surgeon often gives relief and saves life by nothing more than providing a route for its escape from the body, instead of permitting its absorption and the disastrous and often fatal consequences which follow therefrom.

But the microscopic examination of pus is more interesting still. For we find that it is crowded with tiny cells which may be divided into two great

opposing groups. They are all nearly dead, for pus is crammed with corpses, and they it is that make it look creamy and opaque. They are the slain in this conflict between the body and the invaders. Thus in a drop of ordinary pus we find the dead bodies of incredible numbers of the round microbes called cocci. These, of course, are the *fons et origo mali*, the original malefactors. The burglars have entered our house and been killed on the premises. Their discovery in pus, and the proof of their primary causal relation to the whole series of phenomena, is the cardinal revelation of Pasteur and Lister for the surgeon.

But myriads of our servants have been destroyed in repelling the attack; and the tendency of the pus to escape is a beneficial attempt to rid the body of the corpses of burglars and servants, now equally objectionable. These brave servants are the leucocytes or white cells of the blood—or, rather, as it appears, those of the white cells which are in a particular stage of their individual development—and they have died in vast numbers in the course of killing the microbes which now share their grave. The whole process is so extraordinary and so significant not only from the surgical but also from the purely biological point of view, that we must look at it rather more closely; none the less because the principles here illustrated are true of inflammation in general, whether or not it happens to be of a kind accessible to the knife. In pneumonia, for instance, just the same drama is played.

When injurious microbes make an entry into a wound or otherwise, *the whole body*, as a *single* and devoted organism, wholly organised, co-ordinated and mobile, devotes itself to the business of

defeating them. No portion of the human commonwealth is out of touch with the rest; none is more immediately and whole-heartedly served than the other. The danger may threaten in the brain or the valves of the heart or under a toe-nail, the same devotion, sacrifice, efficiency, concentration of purpose is found in every case. It is as if, in human society, the attacks of microbes, say the tubercle bacillus, were as well and devotedly fought when made upon the poor as upon the rich; it is as if the body perceived, what society will one day perceive, that it is a whole, and that injury to any part of it demands the services of all the others in their interests as much as in its own. There is a text here for what might be a great and is certainly a much-needed sermon. The lesson taught by the body whenever a corn becomes inflamed—as much as when the most vital and distinguished of organs is threatened—must yet be learnt by whatever existing State proposes to survive in the struggles of the future.

Let us observe the proof that the whole body is concerned in such cases. It is not to be found conclusively in the fever, for we might suppose that that was merely an annoyance inflicted upon the whole by the disturbance in the part. Nor is it to be found in the fact that there is a great abundance of white cells in the area of battle, for these might merely have been arrested, and commanded for local service, as they passed through the injured tissues. No, the convincing proof is to be found in the fact that the blood, as a whole, is found to contain a vastly increased number of white cells. Normally, such a bulk of blood as might correspond to two pins' heads will contain some eight or nine thousand of

these white cells (interspersed among the four and a half to five millions of red cells which find room, and room for usefulness, in the same small space). But in the special circumstances of need which the assault of microbes creates, the number of leucocytes in such a space may be raised by perhaps as many as five times or more. Thus countless millions of white cells are rapidly produced and poured into the blood stream, in a few hours, when inflammation threatens—or, rather, as we now see we should say, when inflammation is required.

The number of leucocytes produced in this reaction, which is called leucocytosis, varies widely in various cases, and in the course of a single case. It is no guide to the site of the injury, for the whole body is equally precious to itself; but it is a guide to (*a*) the numbers and virulence of the invaders and (*b*) the vigour of the defence. Thus a high leucocyte-count may be a sign of grave infection, *or* of vigorous protection; and if a low count be found where the infection is evidently serious, the patient's chances are bad; whilst a rapid fall in a high count may be welcome if it means that, for instance, a surgical operation has struck hard at the attack, or unwelcome if it means that the patient's powers of resistance, though as necessary as ever, are failing.

Two instances may be cited, from vivid personal recollection, of the kind of fashion, ever being extended, in which such facts as these may be applied in practice, quite apart from their enormous inherent interest. Thus a house surgeon may devote himself to making a blood-count, as it is called, of a patient, every four hours, day and night, for a time, in order to know whether to send for his chief; for the patient has appendicitis, and if the

local trouble is going to take the form of acute inflammation with the slaughter of many leucocytes, the fact will be indicated by the large number of white cells to be found in, for instance, a drop of blood obtained by pricking the lobe of his ear. When leucocytosis occurs, therefore, it may be regarded as an indication that the surgeon should operate; whereas if the count does not rise it may be hoped that careful nursing—commonly called "medical treatment," and indistinguishable therefrom—will suffice to see him cure himself.

Again, the formation of an abscess—for that is what it amounts to—demanding the surgeon's intervention, may be indicated not only in the case of the appendix or anything like it. A little boy had pain in his thigh, with various vague symptoms which could not suffice to indicate the nature of the malady, and certainly would not sanction so serious an operation as cutting down upon the thigh-bone. But he developed leucocytosis, and the surgeon argued therefrom that there was pus-formation going on somewhere—doubtless where the boy felt his pain—and accordingly he operated. Reaching the bone he found nothing—the trouble was not in the covering-membrane of the bone, as it often may be. To open the thigh-bone and find nothing there would be a most unsatisfactory proceeding; and no surgeon could or would have taken this very serious course without due warrant. But the large number of white cells in the red droplet from the little patient's ear had to be accounted for; the surgeon opened the bone, and found therein a tiny focus of pus—which, undiscovered, might have spread until the boy lost his limb or his life. To me the striking of that hidden spot of mischief,

revealed by counting shadowy shapes in a film of blood under a microscope, was a moment of rapture; how glorious that such things could be! It was one of my earliest experiences as a student; and it may be capable of imparting some such feelings as mine to the present reader. The fault is his or mine if it does not; for the facts are very good.

We may ask how the body is able, in such cases, to know what is required and to do it. Its information is derived not from the nerves of the injured part, but from various chemical substances, poisons, ferments, "hormones" or messengers, and what not, which leave the battlefield, whatever their exact source, and are conveyed by the blood-stream to the various places where the white cells are always being made—the spleen, the lymphatic glands, and so forth. Here, by the just and subtle chemistry of the body, the vital processes required for the hasty development of extraordinary numbers of leucocytes, are set in motion or accelerated, and the new cells are poured into the blood, which carries them quickly to the affected part.

They reach it inside the blood-vessels; and of course their business is in the tissues, outside the blood-vessels. They therefore have to disembark, so to say, and proceed to the scene of action. The general slowness of the blood-stream in the neighbourhood permits them to come to a stand against the walls of the thinner vessels. Here they smell the battlefield. The imagery may annoy the reader, but it is surprisingly near the truth. Smell is a chemical sense, and a contact sense; and that is exactly the sense which these cells and their like possess. Chemical substances produced either by the microbes or the affected tissues, or the inter-

action of their respective products—for this whole battle is fought with chemicals—must filter through the walls of the blood-vessels and attract the leucocytes, which " sense " or smell them. The leucocytes proceed, by slow flowing and almost wriggling in a very slow *tempo*, to travel through the wall of the blood-vessel, a process which is known as the " emigration of the leucocytes," or, in the Greek, their " diapedesis." In this fashion, an enormous number of leucocytes, in never-ending succession, reach the actual seat of the microbic invasion, and this battle, conducted as it is by the throwing of chemicals, then takes place at the closest quarters.

With the microscope we do not see the chemicals, of course, and so we used somewhat to misinterpret what next occurs, not realising that success in the chemical battle is that which determines the bodily fate of the combatants—and of the body in which they fight. That bodily fate is remarkable indeed. In pus we find a multitude of dead and partially disintegrated leucocytes. But when we employ suitable dyes, especially those derived from coal-tar, we can so stain the contents of our microscopic field as to show that often one or more microbes are to be found enclosed within the substance of a leucocyte. Here we touch upon the famous work of Prof. Metchnikoff, of the Pasteur Institute, the most illustrious of Pasteur's disciples in pure science now surviving, since Robert Koch has passed away. Following on his observations in the case of the water-flea, Metchnikoff ascertained the remarkable function of the leucocytes in inflammation — and in other conditions also. He proved that they attack and eat microbes, and therefore called them phagocytes or eating cells. Thus what actually happens in

the course of inflammation is that the phagocytes, having been produced in large numbers, and having emigrated from the blood-vessels of the part, attack the microbes, and, if possible, eat them up. The eating up is not an accident, and it is not an invasion of the leucocytes by the microbes. Each of these possibilities has to be considered, and each is disproved. The actual ingestion of an invader can be beautifully observed in many cases, perhaps the most dramatic being that of the malaria parasite. This is not a microbe, but an animal parasite, and it invades the blood itself; but these differences do not affect the validity of the illustration.

A drop of blood from a malarious patient, kept on a warmed slide, will show the actual attack upon the invader by one or more phagocytes, and, perhaps after half an hour, the enclosure of the parasite by the enveloping arms (which are the extempore-wise extended body) of the phagocyte; until at last the normal quick movement of black particles in the malaria parasite ceases, and it undergoes disintegration, the particles lying scattered in the body of the successful phagocyte. The only way in which to win this battle is to eat the foe alive.

Metchnikoff believes that the chemical aspect of the question redounds no less to the credit of the leucocytes; in other words, that the chemical agencies which render the microbes eatable are produced by the leucocytes. Many, however, and most notably Professor Ehrlich, the greatest student of immunity, believe that the chemical work is done by other cells, probably those of the tissues attacked, and that the leucocytes only eat the slain, or, at least, moribund. Certainly the leucocytes do not always do their work. In the case of malaria it may be

that the presence of a minute proportion of quinine in the blood renders the parasites eatable, and that this is the real service of quinine to the patient. Certainly we know that there are times when leucocytes appear definitely to decline to attack the invaders which are swimming beside them. Other evidence, to which we can scarcely do more than allude here, suggests that an essential part of the work is done otherwise than by the leucocytes. Notably in tuberculosis (including, of course, the many tuberculous inflammations with which the surgeon has to deal), there appears to be conclusive evidence that the bacilli are first prepared or "cooked" by substances which are therefore called "opsonins," before they can be eaten by the phagocytes; and there exists an elaborate technique, chiefly due to Sir Almroth Wright, whereby there may be ascertained what is called the "opsonic index" of a patient, which expresses his state of resistance in terms of the number of bacilli which his leucocytes can be observed to ingest within a given time. Whatever the clinical value of this method in medicine and surgery may prove to be, the facts do seem to indicate that the leucocytes, for all their pluck and sacrifice, are not the sole, and may not be even the essential factors in the fight against the microbes of disease.

One cannot compend a treatise on inflammation within these limits, nor is there any occasion to do more than state the essentials as Lister and his followers have revealed them to us. There is, however, at least one point of high importance to which reference must be made before we consider Lister's application of the new knowledge to surgical practice.

In some inflammations we may find a "pure culture" of one kind of microbe only—such as the cocci which are seen in bunches and called staphylococci, or those which are seen in chains and are called streptococci. Again, in other kinds of inflammation, common to medicine and surgery, we may find the tubercle bacillus alone. It is a general principle, to which there may be exceptions, but are none of known importance, that the body's chances are better when it is attacked by only one kind of microbe. But too often we find a mixed infection, due not to simultaneous attack by two or more kinds of microbe, but to primary infection by one and secondary infection by another. This question of mixed or double infection is doubtless of importance in a multitude of conditions, as, for instance, the pus-formation in the skin of a patient who has first been attacked by the microbe of small-pox (whatever that may be); and in the terrible inflammations in the throat which are amongst the gravest "complications," as we used to say, of scarlet-fever; but there is one case of such high and widespread and close-spread importance, to be seen all over the world and thickly everywhere, that we must specially consider it; not least because multiple daily tragedies everywhere follow the neglect of Listerism in this regard.

Of course it must be tuberculosis, the universal (and universally preventable) disease, to which we refer. Now to consider first its commonest form, which is pulmonary tuberculosis or consumption, physicians have learnt that the difference between a simple infection of the lungs by the bacillus of Koch, and the addition of a secondary infection by, for instance, the cocci of "surgical inflammation,"

may be the difference between life and death. It may be, incidentally, the difference between losing no weight and acute emaciation, between normal sleep and intense night-sweating; perhaps between an " opsonic index " which is of value, and one which is of none—for the power of the white cells to eat up tubercle bacilli may avail little if there are countless baleful cocci to contend with also.

Now physicians have been aided in their study of these differences by the most salient and tragic lessons derived from the contrast between the good or Listerian and bad or pre-Listerian surgery of " surgical tuberculosis." For the tubercle bacillus, usually swallowed in the milk of tuberculous cows, invades the lymphatic glands (" glands in the neck " is the result) and the joints and the bones, and many other parts of the body; and here the surgeon is often called upon to deal with the consequences. Now these forms of tuberculosis may be cured by the body, aided instead of thwarted by the physician, just as pulmonary tuberculosis may be. On the other hand, the surgeon's knife may be invaluable in giving outlet to a tuberculous abscess or otherwise; or it may seal the patient's doom by producing a secondary infection.

Thus perhaps the commonest form of surgical tuberculosis is that found in the lymphatic glands on either side of the neck. These may recover " spontaneously," as we say—" that blessed word ' Mesopotamia ' "—or they may be bodily excised by the surgeon, or they may be opened in a dirty way—and when the surgeon talks of dirt he means dirt indeed—admitting the cocci of " surgical inflammation," and the mixed infection will at the least involve an ugly and otherwise avoidable scar

in a conspicuous place, and at the most may be the beginning of the end. Worse still is the everyday case of the tuberculous abscess, derived from tuberculosis of the spine, which has been opened wherever it has pointed, in back or thigh, by a dirty surgeon who should be dead, has become the subject of mixed infection, and will never cease to discharge until it has killed the patient. Yes, indeed, the child has had treatment; and one school of administrators, fighting against school clinics, will be satisfied, especially if a certain society connected with charity provided the ticket therefor; but Heaven help it, *what treatment?*

This subject cannot here be pursued, but enough will have been said to show what an alliance between invaders means to the body-politic. One kind of enemy may be countered by the manufacture of exquisitely fitted weapons for its repulsion; and that is the rule. But it is also the rule that the weapons so exquisitely fitted for one enemy are impotent for another—all immunity is probably specific, as we say—and thus a secondary infection is the great disaster. It follows that the surgeon who "treats" a focus of tubercle bacilli, for instance, by opening a route for cocci and planting them there, is simply depriving the patient of his one chance. Nay, more; the surgeon may have done well, and have made an exit for the worthless material, without planting any cocci; but what of the days and weeks during which the wound is dressed, and what of the fingers which do the dressing? Truth to tell, only the finest Listerian nursing can do this work, and if it cannot be guaranteed, no cleanliness at the time will justify operation. Alas, much more might be said; but school clinics are

coming, seek to arrest them who may; "anything is as good as established, when that is established that will produce it and continue it."

We have run on rapidly from those early days, not only to the present, but even to the near future! Let us now return, and observe how Lister applied the principles of the new knowledge, the present outlines of which we have briefly reviewed.

Let us consider what the surgery of the time was, and we shall understand the immediate problem. It was not, then, essentially a question of performing some constructive operation through unbroken skin, as in making an intentional compound fracture in the cure of knock-knee—a beautiful and representative instance to which we shall duly come. On the contrary, in those early days the problem was to deal with the accidental compound fracture, already grossly infected, and demanding immediate operation, as compound fractures then constantly did. The microbes were already there; and the problem of destroying them was more urgent than that of excluding more. "Sepsis" was present and an antiseptic was required; such an antiseptic being, of course, a germicide, on the theory that germs were the cause of the sepsis. Thus, in a fashion not unlike that of Sir James Simpson some twenty years earlier, Lister set about looking for some suitable chemical, fit to do the particular deed he required; and as Simpson found chloroform, so Lister found carbolic acid, supplied him by the founder of the firm whose name is still closely associated with that most celebrated of antiseptics. If, then, carbolic acid killed germs, and germs killed the patients, carbolic acid should save the patients. And it did. The crushed legs of the

victims of street-accidents and the like were removed as formerly, but the free employment of the antiseptic enormously reduced the subsequent mortality. We may say that approximately one in three was the death-rate after major operations—mostly amputations, the surgeon being chiefly a "saw-bones"—before those new days; instead of perhaps one per cent nowadays. The best figures, however, are those of most recent attainment; the immediate point is that Lister's earliest figures under the new method were a most notable contrast to the old ones. It is true that, as *The Times* very happily put it, as his solutions grew weaker his arguments grew stronger, and we shall later discuss the meaning of this paradox, with its apparently disconcerting criticism. But the arguments provided by even the strong solutions were strong enough.

There were no half-measures about what we may now, in all reverence and gratitude, call primitive Listerism, as it was practised in Glasgow in 1868 and 1869, in which latter year Lister exchanged his chair of surgery there for the chair of clinical surgery in Edinburgh. Considering the effect of even modern pure carbolic acid in high dilution, upon the skin and tissues, we may be sorry as well as glad for everyone concerned. What fingers the surgeons and dressers must have had in those days! The carbolic acid was most freely employed. The wound and the dressings, the instruments and the surgeon's and assistants' hands—all alike were treated with the utmost vigour and rigour. The thoroughness was splendid, nor without it, though we may almost feel inclined to laugh, should we have had the thoroughness, so different and contrasted in detail,

of to-day. Lister advised those concerned to try to imagine everything—every surface, animate or inanimate, everywhere—as covered with wet green paint; and thus one would avoid casually touching one's coat, or a chair, or adjusting one's eyeglasses, or touching any surface whatsoever unless it had first been most abundantly treated with carbolic acid. The "green paint" idea was to impress upon the imagination the ubiquity of microbes.

But even when all surfaces were suspect and either avoided or deluged with poison, there remained the air, and Lister feared that also. He had reason, for even if he had outgrown the long-standing belief that the air is the cause of inflammation, yet the results of exposure of wounds to the air appeared evident, and it might well be that the air contained the peccant microbes. Let us remember the disease called malaria or "bad air," which until the other day was believed to be due to exposure to the night air, but is really due to the bites of infected mosquitoes contained in the night air. Similarly here, though Lister's work had acquitted the air as air, yet there were the possible microbes which the air contained. Hence he employed at first a carbolic spray, an engine designed continuously to sprinkle the air in the neighbourhood of the operation with carbolic acid, and so "wing" the possible microbes with its hail of deadly drops. Of this I can speak only from hearsay, the carbolic spray having been abandoned long before my student days; but I can still laugh at the tales told by my teacher, Prof. John Chiene, of those old days, and especially of one occasion when the apparatus broke in a certain well-remembered theatre (now probably condemned on Listerian principles) and

a stream of carbolic acid made for the passage past the boots and the comments of the Pioneer. Merely to have seen the very place, and to have learnt from the lips of an illustrious pupil, is to know in some measure what words like "progress," "science," "evolution," "imagination" mean; and to realise how tremendous a thing it is to be a child of the past and a parent of the future.

The carbolic spray was abandoned, for the sufficient reason that as good results, and better, were obtained without it; and the experimental evidence thus showed that the air is not so much to be feared as was thought. It contains microbes, assuredly, but commonly not the microbes of surgical inflammation; and since this is so, the manifold disadvantages of the carbolic spray, even when it did not burst, sufficed to condemn it. But whilst we laugh at this cumbersome and unnecessary and inconvenient device, we may consider that the air which leaves the surgeon's mouth and nostrils, and those of his assistants, may very well be dangerously laden, whilst there are possibilities of dangerous contributions to the air from his hair—and beard, if a modern surgeon permitted himself to wear one; but these modern priests of humanity shave for sufficient and evident reasons. Thus the idea of the carbolic spray is a sound one; and the surgeon who shaves, and covers his nose and lips, and wears a cap, is simply doing in a vastly better way, and without disadvantage to the patient, and to his technique, what the carbolic spray sought to do forty years ago. To this subject we must return in a later chapter, but we could not record the abandonment of the carbolic spray without noting that the surgeon of to-day does better what it sought

to do. It was not merely superfluous; nor was Lister anything but right and thorough and fruitful in introducing it.

His earliest results, which would of course horrify any surgeon of our time to-day, were abundantly sufficient for their day. A parallel may here be drawn, perhaps, with the case of the introduction of inoculation for small-pox by Lady Mary Wortley Montagu in the eighteenth century. Inoculation was dangerous; many who sought its protection were killed by it; but people hastened to avail themselves of it notwithstanding. We look at modern vaccination, and we read the results of inoculation; and *then* we may begin to realise what small-pox used to mean. Similarly we look at contemporary surgery, we read the impression made upon the living minds of the time—not, of course, the dead ones—by Lister's early results; and *then* we may begin to realise what surgical inflammation used to mean.

There were dead minds, of course, for the body too often survives the soul, as Marcus Aurelius observed long ago. And there were many varieties of perverted, as also of reasonable criticism, some of which we may endeavour to consider in the following chapter, in their due historical place, before we consider the deeply interesting record—I scarcely think it would be possible to make it uninteresting—of the development from those early days of carbolic acid everywhere, to our own. But here we leave this chapter, for we have seen the beginning of the end of terrors and horrors innumerable. Lister has intervened.

He intervened as the latest representative of knowledge instead of opinion, inquiry instead of assumption, question instead of acceptance, action

instead of inertia, human beneficence instead of acquiescence in a Providence which is incarnate in such as he, or nowhere. How many prayers and entreaties, how many objurgations and curses, how many vainly intercessory sacrifices of the living to the dead, of the many to the few, of the young to the old, how many superstitions and follies, how many quackeries and shams and apologies and lies, how much fruitless love and hope and labour and courage and dexterity, how innumerable, unimaginable a multitude of lives sacrificed to that most jealous of gods called Nescience, the bloodiest and greediest Moloch of them all, how many poisoned mothers, killed by the act which launches new life into the world, how many hideous battlefields, how many infected hospitals, how many asylums for maternity whence none but the babies issued alive, how many blinded eyes, blocked ears, how many maimed bodies, compressed or poisoned brains, through which issued insanity and impotence and paralysis and crime, how many more evils of young and old, rich and poor, wise and foolish, dying or about to be born, white, black, or yellow, innocent or guilty—had preceded this hour which announced their end. There is no pen, nor ever was nor will be, that could do justice or a tithe of a tithe of justice to the meaning of that sacred moment in the history of mankind when the slowly but surely seminal labours of the appointed in many past generations, hitherto unavailing, jeered at by fools, unknown by the crowd, trivial in the eyes of kings, culminated for the saving of fools and crowds and kings alike, in Listerian surgery.

## CHAPTER VI

### THE CRITICS

"The Universe has need of him," was the reflection with which Marcus Aurelius used to fortify himself when some apparently superfluous and injurious person had tried his temper. There are cases in which the Aurelian creed is of faith rather than of reason; but the need for critics in science is indisputable, and even the least intelligent and most unfair may fulfil their humble function. In science we can take no one's word—least of all in matters of life and death; nor is it possible to inquire closely into the evidence for any scientific statement, without throwing more light upon the subject.

One must therefore beware of bitterness in this chapter; and for the better dealing with the more important critics of Listerism, some of whom have undoubtedly been potent in preventing its practice in many cases, let us first dispose of the more obvious, inevitable and dull critics, whose race is now entirely extinct—one of the last survivors being a hospital surgeon and extra-mural teacher in my student days, when he was generally known, in reference to his surgical technique, as "dirty ——."

This excellent gentleman, whose surgical creed was thus briefly epitomised by his pupils, had simply represented the consequences of that transition from the dynamic to the static which commonly

marks advancing years, and has its illustrations in every organ and function of the post-mature body. He and his like had done with change, especially change in fundamentals; and even though their teaching function should have kept them learners, they found it hard to recast all their ways of thinking and doing, and acquire a new, complicated and most exacting technique when the time was near at hand for them to wield a bistoury for the last time. In this particular and remarkable epoch, the like of which was never seen in the history of surgery, not even the substitution of the ligature for the red-hot iron by Paré furnishing a precedent for it, we must admit that Lister's colleagues were overwhelmed by the force and beauty of his demonstrations; and that the new method triumphed very rapidly wherever it was seen. Almost at once, Lister was asked to Edinburgh, at that time the leading medical school of the planet, and there he rapidly advanced his technique and won over nearly all his colleagues. In Denmark and in France his methods were introduced by one or two keen followers; and, at last, through the personal influence of one who knew the meaning of his work, he was invited to London, and established Listerian surgery in King's College. London should not have lagged behind Edinburgh and the Continent; but one who is now a loving Londoner must admit that London always did and apparently always will. Yet perhaps that last clause is scarcely justified, for when William Harvey discovered the circulation of the blood, the greatest physiological discovery ever made, he "fell off mightily in his practice," by reason of his fellow-practitioners' opinion of him; and London did much better than that by Lister—

when at last it discovered him, his fame having advanced upon this well-entrenched capital from every terrene quarter, north, south and east.

On the whole, then, we may record that, such was the need for Listerism, and such was the quality of even its earliest doings, that the opposition of surgeons themselves—by which I mean the few best surgeons—was rapidly conquered, and was doubtless of value as discipline and education to the precious young life the leaves of which are now for the healing of all nations.

One colossal opportunity, provided, as it were, at the earliest hour, for the beneficence of Listerism, was utterly lost; but here we must blame not so much the critics as the dull, the deaf, the blind, the null, the surviving corpses. It was not because Listerism was effectually—or even ineffectually—criticised, nor because its earliest results, in amputations, were not only too relevant to the opportunity, that the revelation of 1868 and 1869 was as if it had not been in the Franco-Prussian War of 1870–1871. Merely let the fact be here recorded, for it is indeed part of history; nor can any one who has looked at the inner record of the Russo-Japanese War lightly question that the issue of the earlier campaign might very well have been reversed if the French military authorities had employed the principles of Listerism—to which the countrymen of Pasteur had almost some prescriptive right. But however that may be—and I dare swear the reader has little idea how much may be convincingly said for what seems, perhaps, an extravagant thesis—certain it is that the individual destiny of how many scores of thousands of soldiers, and of those who loved or depended on them, was darkened in that

terrible war when Listerism had already dawned and might have lightened it. We shall return to the relations between modern surgery and modern war, but the tragedy whereby Listerism was in time yet not in time for the Franco-Prussian War may here be insisted upon. And here we may leave the consideration of the mere dullness, apathy and blindness which Listerism, like every other new thing, however good, had to encounter.

Turn we now to a very different type of opposition; one which thoroughly vindicates the critic's general claim to utility. The merely dull or accustomedly "dirty" surgeons need be no further considered, for their results were according to the seeds they sowed in their patients' wounds, and the immediate judgment went against them. But there were one or two operators of a very different class, above all Lawson Tait of Birmingham, whose original work on the frontiers of surgery is operative at this hour and will always be remembered. The men in question not merely opposed Listerism, but they opposed it with the best kind of argument—good results obtained without it. As we shall see, they were really practising what was not far from the subsequent development of Listerism; but the future could scarcely then be foreseen, and the contemporary appearance was simply that of a controversy between a surgeon who employed powerful chemical lotions and sprays, obtaining notable results, and another who forwent any such aids but did not forgo cleanliness—and obtained results no less notable.

Lawson Tait must have been an exceedingly fine operator, bold, rapid and skilful. His work lay not with horribly septic compound fractures and their like—in dealing with which the inadequacy of his

methods would have been apparent, for he had nothing to oppose to the microbes already present, and Lister had—but largely with operations, of an apparently very formidable kind, which involved opening the body in cases which were not infected or septic at all. His particular province was in the surgery required by women, and we now know that women have a much higher degree than men of natural resistance to the attacks of microbes in the abdomen. Every one is familiar with the greater liability of men to appendicitis; but it is still more noteworthy that serious microbic invasion of the peritoneum, the lining membrane of the abdomen and its organs, is much less dangerous in women than in men. They largely decline to permit more than the merest beginnings of peritonitis, and they often recover, as it seems almost miraculously, from very grave and widespread peritonitis. Thus, as we have since learnt, Lawson Tait had an enormous advantage in the sex of his patients, whom Nature, knowing her demands upon them, has made so remarkably resistant to abdominal damage of all kinds.

Not less interesting is the other factor which accounts for Lawson Tait's results, and which helped him, for so long, to achieve notable triumphs without the aid of carbolic acid. After all, though microbes are everywhere, those which the surgeon has reason to fear are not: the vision of "green paint" on every surface is exaggerated, though salutary. As for the surfaces which are almost alone to be feared, Lawson Tait and those who were of his school went very far with cleanliness. "Soap and water" they believed in; and so does modern surgery. My old teacher, Dr. J. W. Ballantyne, once told me that, when examining at a certain most ancient and illustrious

University which shall be nameless, he used to ask the candidates how they would sterilise their hands before the performance of a surgical operation, and, on being told that the hands should be steeped in a solution of carbolic acid—"1 in 40"—would reply with the by no means impertinent question, "Have you never heard of a nail-brush?" Now Lawson Tait and his school had heard of nail-brushes, and they believed in soap and scrubbing, and ever-flowing water. With these devices for attaining not only cleanliness in the ordinary sense but also, as we readily see, a very high measure of surgical cleanliness, which is absence of dangerous microbes, and with their operations upon the previously unbroken and thoroughly washed skin of their highly resistant female patients, whose peritoneums and white blood cells were usually quite equal to swallowing up a few chance microbes without any appreciable fuss—no wonder the arguments of Lawson Tait against the champions of antiseptic solutions were substantial and formidable. Nor were they the less so because, as we shall abundantly see later, these solutions, especially as they were then employed, not merely killed microbes, but also killed and weakened those cells of the patient upon which the great business of destroying microbes and of repairing breaches of tissue depends. Now that the controversy is ended, and Lawson Tait has gone; and now that a new controversy, most interesting and useful, is being maintained between surgeons whose practice involves more chemicals and those whose practice, like his, involves less or none—we need not grudge him the praise due to those best friends of any new thing, its discerning and constructive critics. And, verily, it would be worth while, if it were possible, to see work-

ing side by side, a modern ovariotomist, practising the best "aseptic" methods, which we shall shortly discuss; and Lawson Tait, the *clean* critic of a generation ago. Both parties to that controversy were indeed right, and both wrong; for it takes two halves to make the truth.

Finally, and at inevitable length, we have to consider a very different group of critics, who have neither skill nor knowledge nor judgment, nor any alternatives to that which they condemn, and from whom, except by repercussion, has never yet proceeded any advantage to man, woman, child or animal; who, themselves powerless to save, are the sworn enemies of the greatest deeds yet done by man for men. Yet we must distinguish. When we have dismissed with loathing those who oppose vivisection without personal humanity as their motive, who lie, traduce, cheat thousands out of their one chance of life, and seek to arrest the advance of the most beneficent forms of knowledge, which have already saved the lives and limbs and ease of countless multitudes of men, women, children, dogs, cats, horses, cattle, grouse, kings, mothers, savages, animals wild and domestic or in zoological gardens—when we have rejected these for the worse than vermin that they are, we must bow before the exalted and inestimable emotion which dominates, if it also deludes, the honest anti-vivisectionist. The leaders of the cause may doubtless have other motives too, for their personal credit is often bound up with their making good their case: but very rarely does human conduct proceed from one motive only, and we are bound to admit that, on the whole, the emotion underlying the anti-vivisection campaign is that which opposes alcohol, which freed the slave, excluded

children from coal mines, saves the life of every baby that survives in the world. It is the pitiful compassion for the helpless, derived by the simplest of transmutations from the parental instinct; and since the existence of a species whose individuals are born helpless wholly depends thereon, and since it is the source of all the best in our nature, we are ill-advised to despise its most misguided manifestations. I vividly remember an incident at a meeting which we convened in London not so long ago, for the formation of a society to destroy rats and similar animals which convey plague and other diseases of mankind. Near the end of the proceedings, after some of the most eminent medical and biological authorities had spoken, a brave lady made a protest against cruel agents, and a plea for whatever methods of destruction should be most humane: and very nearly every one greeted her with hearty and spontaneous laughter. There was nothing whatever to laugh at. She was pleading for life, and so were we. The anti-vivisectionist, who hates the thought of others suffering and strives to prevent it in his way, the vivisector, who hates the thought of others suffering and strives to prevent it in his way, are both actuated by one and the same noble emotion. There is the pity of it; for, as Hegel said, the tragedy of the world is the conflict not between right and wrong, but between right and right.

It is a tragedy indeed in the present case. Not merely do the anti-vivisectionists injure those whom they seek to benefit, animals and human beings alike; but their emotional force, their courage and patience and powers of persuasion are all lost to the very cause for which they are really striving, and which so urgently needs them. Consider the apathy and

stupidity and acquiescence of the overwhelming majority of mankind in all classes; their callous composure in the presence of the preventable ravages wrought by customary evils like consumption and alcoholism, and their fatuous fear in the presence of any inconsiderable novelty with a startling name, such as "spotted-fever," or the accidental occurrence of arsenic in beer—as if beer did not already contain alcohol: consider the measure of force which in all ages is demanded of the few who feel, wherewith to animate the general company of the moribund, walking blind and deaf to their own funerals; and ask whether it is not a tragedy that any iota of this precious force should be pitted against itself, when the present and posterity are dying even now for the lack of it. There is the pathos of this pitiful farce, upon which the curtain of each successive year rises, though always it seems as if it could last no longer.

Here, in London, are Mr. Sydney Holland and Mr. Stephen Paget, for instance, doing splendid work for their hospitals, each in his own way. And here, to boot, is Mr. Stephen Coleridge, also a humane and devoted man, related in name and blood and feeling to the poet who taught us in the "Ancient Mariner" that wilful cruelty to anything that lives and can feel is a foul and hateful thing. How many London hospitals that envy the London Hospital its treasurer, notoriously the most successful and unintermittent beggar in the world, would not be doubled in efficiency if they could obtain the similar services of Mr. Coleridge? Yet instead of our having these three men's force and power on the side of humanity and progress, year in year out we see much of their time and skill and force mutually annihilated—Mr.

Holland begging for the hospitals, and Mr. Coleridge begging the public not to give to the hospitals, and Mr. Paget doing his splendid work as Honorary Secretary of the Research Defence Society, formed to counteract the society of which Mr. Coleridge is the Honorary Secretary : and all three men primarily moved by the same high and precious emotion.

Let us then see whether a further statement of the case, in connexion especially with the genesis and development of modern surgery, may perchance win over for any branch of effective humanity even one of those who, at present, are fighting, as I believe, against their own side. Not that one should be too sanguine. Some eight years ago I left the court, amongst the most delighted of many spectators, after a special jury had awarded £2000 to Prof. Bayliss for Mr. Stephen Coleridge's libel upon him in the case of a certain " brown dog " (which died a merciful and painless death under chloroform, such as any of us might well hope for). Those two thousand pounds went to the support of physiological experiment in University College, and therefore to the life and health of many men and dogs, white and brown, yet to come. But great was the error of supposing that, for this country, at any rate, the anti-vivisection crusade was at an end. Nevertheless, let the special facts of the question, as they bear upon our subject, be hopefully stated. And let them be prefaced by a notable and unchallengeable *dictum*. The following quotations are extracted from the Introduction written by Lord Lister himself to Mr. Stephen Paget's well-known book, " Experiments on Animals." The unexampled authority of the writer should be more generally known than it is to be on the side of humane and responsible experiment upon living animals :—

"Mr. Paget has become widely conversant with such investigations ['researches involving experiments upon the lower animals'], and has been deeply impressed with the greatness of the benefits which they have conferred upon mankind, and the grievous mistake that is made by those who desire to suppress them.

"The action of these well-meaning persons is based upon ignorance . . . they deny that any good has ever resulted from the researches which they condemn. How far such statements are from the truth will be evident to those who peruse this book. . . . from the discovery of the circulation of the blood onwards, our knowledge of healthy animal function has been mainly derived from experiments on animals.

"The chief bulk of the work is devoted to the class of investigations which are most frequent at the present day; and it shows what a flood of light has been already thrown by bacteriology upon the nature of human disease and the means of combating it.

"The chapter on the Action of Drugs will be to many a startling disclosure of the gross ignorance that prevailed among physicians even in the earlier part of last century. The great revolution that has since taken place is no doubt largely due to advances in sciences other than Biology, especially Chemistry. But it could not have attained its present proportions without the ever-increasing knowledge of Physiology, based on experiments on animals; and Mr. Paget shows how large a share these have had in the direct investigation of articles of the Materia Medica.

"The concluding part of the volume discusses

the restrictions which have been placed by the legislature in this country [Great Britain] on those engaged in these researches, with the view of obviating possible abuse. Whether the Act in question has been really useful, whether it has not done more harm than good, by hampering and sometimes entirely preventing legitimate and beneficent investigation, I will not now discuss."

All the principles of evidence, credibility and belief must be abandoned if this considered judgment of Lord Lister's is not to stand against that of Mr. Coleridge, who had never seen a vivisection experiment in his life, as he told the court in Bayliss *v.* Coleridge, or of Miss Lind-af-Hageby, whose first experience was of the " brown dog," and who, going to be horrified, was most successfully horrified—by happenings which existed only in her mind. Also the words quoted should abundantly suffice to dispose of the very few and insignificant medical men, much quoted, who differ from Lord Lister in this matter, and also in this other—that they have not yet added anything of any worth to human knowledge or practice.

But we began by admitting that no one's word can be taken in science; and though the verdict of Lord Lister on the historical facts needs no recitation of those facts to support it, they are of such high interest in themselves, and they introduce us to the so tragic fate of a pioneer, that we must here review them: nor can we do better than recall Lord Lister's own narrative, to be found in his Huxley lecture of 1900:—

" After being appointed to the Chair of Surgery in the University of Glasgow, I became one of the

surgeons to the Royal Infirmary of that city. Here I had, too, ample opportunities for studying hospital diseases, of which the most fearful was pyæmia. About this time I saw the opinion expressed by a high authority in pathology that the pus in a pyæmic vein was probably a collection of leucocytes. Facts such as those which I mentioned as having aroused my interest in my student days in a case of pyæmia, made such a view to me incredible; and I determined to ascertain, if possible, the real state of things by experiment."

Now observe how failure followed the best efforts until experiment revealed the truth. Lord Lister continued:—

"While these investigations into the nature of pyæmia were proceeding, I was doing my utmost against that deadly scourge. Professor Polli, of Milan, having recommended the internal administration of sulphite of potash on account of its antiputrescent properties, I gave that drug a very full trial as a prophylactic. . . . At the same time, I did my best, by local measures, to diminish the risk of communicating contagion from one wound to another. I freely employed antiseptic washes, and I had on the tables of my wards piles of clean towels to be used for drying my hands and those of my assistants after washing them, as I insisted should invariably be done in passing from one dressing to another. But all my efforts proved abortive; as I could hardly wonder when I believed, with chemists generally, that putrefaction was caused by the oxygen of the air.

> "It will thus be seen that I was prepared to welcome Pasteur's demonstration that putrefaction, like other true fermentations, is caused by microbes growing in the putrescible substance. Thus was presented a new problem: not to exclude oxygen from the wounds, which was impossible, but to protect them from the living causes of decomposition by means which should act with as little disturbance of the tissues as is consistent with the attainment of the essential object. . . . To apply that principle, so as to ensure the greatest safety with the least attendant disadvantage, has been my chief life-work."

It is for us particularly to notice in the foregoing that Lord Lister's efforts against the "deadly scourge" (which most of the younger generation have never seen) failed for want of the one cardinal piece of knowledge which only experimental research —so-called "vivisection," a term which we should use only if we remember that every surgical operation is equally and similarly a vivisection—could give. There was no question that putrefaction occurred in pyæmia, nor that the disease was contagious: than those two facts nothing could be more appallingly evident. And substances were known, as they always have been known, which interfered with putrefaction. But so long as the essential cause of the disease remained unknown, the best and wisest efforts of the greatest surgeon of all time were of no avail; whereas no sooner had experiment revealed the truth than surgery was transformed.

A point worth noting before we proceed is that by no means all drugs which interfere with putrefaction and claim and obtain the name of antiseptics are

genuinely germicidal. The test for putrefaction employed by the ancients, and by those of the ancients, a numerous progeny, who still survive, was the sense of smell; and to this day anything which paralyses the sense of smell, or overwhelms it by the introduction of a screening odour, or absorbs the malodorous gases of putrefaction, or neutralises them chemically by oxidation or otherwise—may be looked upon as an antiseptic though it really does nothing to arrest putrefaction, much less to kill its living causes outright. Hence the "antiputrescent properties" of this drug, and the "healthful vapours" of that, or the "deodorant powers" of another, or the "fumigation" effected by a fourth—may all fail and *did* all fail. But to find and convict the cocci, and to dose them with carbolic acid, which kills them, was to make a new earth in so far as surgery and maternity and much more are concerned. And the opinion of those who did this work is not only that it was done by the aid of experiment upon animals, but also that it could not otherwise have been done.

One most tragic and instructive episode in this brief history had best be considered when we come to consider the services of Listerism to motherhood; and that episode will show, still more clearly, that only the bacteriological knowledge which experiment on animals affords could suffice for the control and ultimate abolition of puerperal fever, the great enemy of maternity. And we shall see that, just as Lister's efforts to control pyæmia failed until the criminal coccus was caught and convicted, so also the efforts of his predecessors in this field, Oliver Wendell Holmes in his manner and Semmelweis in his, were without their due fruition because the bacteriological basis was lacking.

Time is the best friend of truth, and its verdict in this matter is no longer doubtful. Before bacteriology the evidence of the value of research was clear; but in our own time it is overwhelming and inexhaustible and infinite: not one week passes but we gain new knowledge by this method. Its services to animals alone are incalculable; for every dog which breathes chloroform and never wakes, many are saved from pain and death and the loss of limbs by the knowledge thus obtained.

The function of the humanitarian will always remain. It is for him, whilst no longer daring to arrogate to himself alone the possession of all the tender mercy in the world, nor any longer lending his voice to libel and slander and such vile suggestions as that the physiologist, the bacteriologist, and the surgeon who is preparing by operation upon the lower animals (who die the most merciful of deaths) for doing his duty to mankind, are secretly indulging a morbid and nameless lust—it is for him, surely, to keep due watch over the risks which are involved in all human opportunity and, by duly approving necessary and merciful researches, to strengthen his case against cruel sports and against those occasional cases, now scarcely if at all paralleled, where some Italian physiologist has made experiments on pain and the limits of its toleration. Such researches are loathsome in themselves and wicked in their consequences, since they are used potently as arguments against just and humane inquiry; and it is to be hoped that Italy, none too celebrated for kindness to animals in its streets and lanes or in its games, may soon bring its standard of research upon living animals up to the high Anglo-Saxon level.

Finally, here is my knee to the noble and merciful ideal which inspires those against whose campaign this chapter is a protest. They demand high honour from the humble historian of the humanest deed in history.

## CHAPTER VII

### THE DEVELOPMENT—ANTISEPTIC AND ASEPTIC METHODS

We now come to a most interesting chapter in the history of our subject, and one which is still unfinished, for Listerism is far too full of life to have ceased development. We shall see, also, that the controversy between those who employ the antiseptic method and those who prefer the aseptic method, is by no means a matter for the surgeon and his patients only, and that the golden mean which will win the day at last is applicable not only to the technique of the surgical theatre, but to no less important a question than the preservation of food for the monstrous cities of our time, for ever crying, "Give, give, give," with one day between them and starvation. It has not been observed that this question of "antiseptic" *versus* "aseptic" is the same question, whether we are discussing the preparation of the patient's skin before a surgical incision, or the carriage of milk to nurse him back to health thereafter.

We must go back to first principles for the key to the facts: for they depend upon the circumstance that all life is one, and that *what poisons microbe poisons man*. The whole truth has a correlative half, that we all differ and that one man's meat is another man's poison, which is true of microbes also, and

represents the modern and future principle of poisoning microbes and saving patients by means of specific vaccines and sera. But here we are concerned with the first half of the truth, which is that many substances will be poisonous to all or practically all forms of life, because they interfere with fundamental processes shared by all living things. We may apply the name of protoplasmic poisons to all substances which, in suitable circumstances, are posions to protoplasm, "the physical basis of life," wherever it is found. Amongst such substances are alcohol, chloroform, ether, carbolic acid, arsenic, hydrocyanic or prussic acid, and a host besides; and they definitely belong to this class, for good bio-chemical reasons, notwithstanding the fact that all of them may on occasion, and in certain ways, be profitably brought into medicinal relation with living beings. They are all of them antiseptics, of course, for nothing can live in the presence of a sufficient concentration of any of them, though alcohol has the distinction, amongst substances of this class, that the *bacillus aceticus* lives upon it, having the power to decompose it, forming acetic acid; and that man attempts the same feat, with somewhat less success than the microbe.

The vinegar microbe apart, alcohol and carbolic acid, to name only those two, are powerful antiseptics, but the properties in virtue of which they kill microbes are equally lethal to living cells in general. Carbolic acid effects a physical change in certain proteins, the fluid state of which is necessary to all life (for all life is lived in water), whereby they become solid; and this coagulation, which kills the microbes in a wound, also kills whatever living cells the antiseptic reaches in sufficient concentration,

and weakens many more. There may well be other chemical explanations of the consequences, but there is no doubt as to the general result. The inflammation, as we have seen, is a battle between two sets of living things : the carbolic acid kills both indifferently, and the same is true of alcohol, or the salts of mercury, or indeed of antiseptics in general. There are plenty of boasted antiseptics which do no injury to the human body, but unfortunately they are not antiseptics, or they would.

If, now, we recall the elements of healing and repair, and realise that the body heals itself if it is healed at all, we shall be ready to question the influence of our undiscriminating chemicals upon the permanent necessities of the patient's welfare. Evidently there are two sides to the question : just as there were, for the matter of that, when the surgeon used the red-hot iron to cauterise a dirty wound. The iron killed (as we now know) the causes of the threatening gangrene, but it also killed much of the patient's body ; and though the result, " on balance," was often to the patient's credit, the dangers were obvious. The carbolic acid and the cautery are very precisely parallel in this respect, nor can the case need to be made clearer, save only to say that, of the two, the carbolic acid offered a far higher preponderance of advantage to the patient, especially as its use in weak solutions could be taken advantage of in frequently dressing a wound, and employing the mechanical virtues of irrigation. But let us clearly understand that the use of a general antiseptic, which kills whatever forms of life it encounters, is strictly parallel with the use of the hot iron. This may be seen even more clearly if we remember that concentrated or solid carbolic acid is used as a

caustic, and a very good one too, by surgeons, and may in various instances be employed alternatively to cauterisation by heat.

The local employment of arsenic—the deadly action of which upon nerves is known to all who boast bad teeth and good dentists—is seen in the "cancer pastes" which used often to be employed. The cells of the cancer may here be taken as quite parallel with the microbic cells in other cases. The arsenic may kill the invading cells, but the objection to its use is that it does more, for it cannot discriminate. Again, in various forms of disease, due to invasion by a microbe, or to invasion by body cells turned traitorous and parasitic, as in cancer, we may employ entirely novel forms of antiseptic or anti-parasitic, such as radium and the Röntgen rays. Here, also, one practical difficulty is that these agents do not discriminate, or discriminate imperfectly, between friend and foe.

Enough will have been said to show the parallelism between the surgical question and many others. Let us now examine more carefully the very interesting objections to the full-panoplied antiseptic method.

In the first place, we are dealing with a poison which is to some extent absorbed by the body. There are plenty of cases of carbolic acid poisoning on record, where the patient has died from the absorption of the narcotic drug (as it is) from a dressing. I remember seeing such a case as a student; and realising, as never before, that carbolic acid is a double-edged weapon in surgery. Such accidents are scarcely known nowadays, for many reasons, including the greater purity of commercial carbolic acid, and the more restricted employment of what is still, and probably always will be, one of the most

valuable medicaments in the world. The reader must not be unduly alarmed, therefore, nor suppose that carbolic acid is not safely and usefully employed in countless cases everywhere, for it is so employed. But the fact of carbolic acid poisoning will help us to understand the more recent developments of Listerism.

Let it be noted, also, that the various anæsthetics, such as alcohol, chloroform and ether, and the A.C.E. mixture which consists of these three in certain proportions, are all poisons as well. Thus the patient of not so long ago might be receiving large doses of two deadly poisons, such as chloroform and carbolic acid, simultaneously; and doubtless many cases of so-called "surgical shock" were cases of poisoning due to these causes. Recent critical inquiry has clearly demonstrated the importance of both anæsthetics and antiseptics as general or constitutional poisons; and the best modern surgery partly owes the yearly increasing superiority of its results, no doubt, to its careful and successful attention to the simple principle, not fully appreciated by the pioneers, of using as little as possible of these substances. Modern anæsthetists delicately graduate their dose of the drug or mixture of drugs that they favour, so that at no time does the patient get more than he needs at that particular stage of the operation; and thus the total dose of the poison is reduced to a minimum. But not so long ago the anæsthetist was perfectly content to keep his patient "well under," no matter how deeply, provided only that he was in no immediate danger of ceasing to breathe. And just as the modern anæsthetist keeps down the dosage of his poison, knowing that it must in some measure affect the future of the case, quite apart from im-

mediate urgencies, so also the surgeon is simultaneously keeping down to a minimum the carbolic acid, corrosive sublimate and so forth, with which, in past days, everybody and everything concerned used to be unintermittently soused.

The constitutional difference to the patient, after the operation, is very great indeed, and, speaking as a grateful patient myself, I can testify to the advantage, in personal feeling, in absence of nausea, in rapidly returning appetite, and quick recovery, which largely depend upon the skilful, which is also the minimal, employment of anæsthetics and antiseptics in the very best modern surgery.

There is yet another question of constitutional poisoning to consider. Destruction of tissue always means constitutional poisoning by the absorption of the products of the dead tissue. In the pathology of burns, surgeons are largely agreed that the supposed "shock," which so often kills patients, especially children, after extensive burns, is mainly or largely a self-poisoning, an auto-intoxication, due to the absorption into the patient's blood of the decomposition products of the skin which the heat has killed. The body is a whole ; as we must remember for its own understanding and for the understanding of the needs and the ills of communities, which are organisms too. The destruction and death of tissue which follows upon the application of powerful chemicals like mercuric chloride and carbolic acid leads to a process of inevitable auto-intoxication, which is distinct from, but accessory to, the poisoning produced by absorption of the antiseptic itself.

Finally, there is the local effect of the chemical upon those delicate young cells of skin and deeper tissues upon which the process of repair depends.

We have seen that alcoholism and diabetes, for instance, impair the healing powers of the body, and so, as we might well expect, does the local and immediate application of protoplasmic poisons to the cells upon whose behaviour the surgeon's success essentially depends. To take one instance only, consider those tuberculous inflammations, where bad surgery has incised the skin and introduced a second infection, and then seeks to remedy the damage by the employment of antiseptics. Poisoned three or four times over, what chance have the miserable cells of the part? As much as is indicated by the fact that, under such conditions, the wound will never close until the patient's life has drained away through it—nor then.

Such are the numerous, clear, cogent, and commonsense reasons why the antiseptic surgeon ever aims at the ideal of aseptic surgery, honouring carbolic acid as his best friend, yet seeking to use as little of it as possible; not unlike the anæsthetist with his chloroform, or the physician with his quinine or nux vomica. Can it be believed that the anti-vivisectionists have asserted the evolution of aseptic from antiseptic surgery to be an abandonment of Listerism and an acknowledgment of the failure of that which was claimed for a triumph of experimental research? Yet that is what has happened, and it is the reason why I am endeavouring in this chapter to state with special care the *rationale* of this most notable and most beneficent evolution. Many surgeons, not least of them Lord Lister himself, have declared again and again that the antiseptic method has never been abandoned, and that the aseptic method is only a refinement of it. That most obvious fact would

speedily be evident to anyone who witnessed a modern aseptic operation, for he would soon discover that the scrupulous use of powerful antiseptics, *in their place*, was an essential part of the technique. What that place is we shall duly see. And though Lawson Tait obtained remarkable results in his particular field without the use of any chemicals but soap at all, yet we have seen special reasons for his success, and it may be added, first, that his results are nothing to those of to-day, and second, that of course he employed such antiseptics as heat for the sterilisation (as we now know it was) of his towels and the like.

Let us then see what the distinction really is between these two forms of the same method, of which the second is supposed to contradict the first by persons who ought really to avoid supposing anything. It is, above all, *not* that antiseptics are no longer used in the aseptic method. They are used differently. First, the carbolic spray went, unwept, but neither unhonoured nor unsung. I, for one, here honour and celebrate the ingenuity, the thoroughness, the courage, and the scorn of mere inconvenience to his dexterous fingers, which went to the invention of the spray by Lord Lister. Then the powerful solutions became weaker, and the arguments, derived from the results, became stronger, as was well said at the time. And all the while bacteriology was steadfastly pursuing its researches into the life and death and distribution and special virulence of microbes ; whilst surgeons were beginning to undertake operations on the unbroken skin, no inflammation being present, because they felt reasonably confident that they need leave no seeds of inflammation behind them.

Now in such cases, evidently there does not exist the same need to deluge the patient's tissues with chemicals as in the already infected cases to which the antiseptic method was first applied. And when it was realised what were the effects of these chemicals, in these cases where their germicidal power was useless, in the absence of germs to kill—surgeons began to argue that better results should be obtainable in such cases if the antiseptics were kept away from the patient's tissues altogether. And that is aseptic surgery; the word aseptic meaning not "without antiseptics," as the anti-vivisectionists, in defiance of obvious etymology, suppose, but *without sepsis*—an achievement indeed.

Far more formidable, various and efficient are the antiseptics employed in modern aseptic Listerian surgery, than those of the earlier days. The patient's tissues are sacred, and the ideal, when they are uninfected, is to keep them so, and being so, free from the necessity of any contact with antiseptics. But if this is to be effected successfully, there must be no error, no lack of thoroughness, in the antiseptic *precautions* (for that is what they are in such cases) taken everywhere else. For there is an evident element of hazard in this refinement, unless our technique be very perfect and very systematically checked. A few microbes left on the surgeon's fingers, or otherwise accidentally conveyed to the patient, might matter little if vigorous antiseptic solutions preceded and followed them there. But if no antiseptics are to reach the patient, certainly no microbes must, or they will flourish unantagonised—as in the good old days, with their uproariously jolly death-rate, before science (which is, being translated, knowledge) began to desiccate the world and

disgust Mr. Chesterton and other champions of nescience.

If there is to be no doubt about the sterility of whatever touches the patient, we must not have instruments or apparatus the complete disinfection of which cannot be assured. Sponges must disappear from the operating theatre, and gauze swabs, treated with superheated steam and used once only, must replace them. Instruments such as scissors must take to pieces, for more certain cleaning. The prolonged application of high temperatures must be used for whatever will not thereby be destroyed—such as the surgeon's hands. The steam steriliser, best of antiseptics, becomes an indispensable part of every operating theatre. Antiseptic solutions of various kinds are employed for the safe preservation of whatever the surgeon may require; instruments and water are boiled. All these active antiseptic precautions are for the performance of an aseptic operation. Antiseptics of various kinds, together with alcoholic soaps, are employed to disinfect the patient's skin for several hours before the operation. They sterilise the surface layers, somewhat deeper than those which are removed whenever the skin is washed. It is in these layers that microbes are to be found. Beneath them are the living cells of the skin, vital for healing, and they are not reached by the antiseptic, nor do they need to be. The positive scrubbing of the skin with antiseptics, which thus reach the deeper living layers, is still largely practised, but involves infraction of the principle that the patient's tissues shall not be devitalised by chemicals, and the evidence seems clearly to show that it is not necessary if the superficial, infected layers are soberly treated with antiseptics for several

hours. Lord Lister himself has declared that the positive and continued scrubbing, so as to reach the living skin, is not necessary. At the operation, boiled water—to which, perhaps, a small percentage of common salt has been added so as to make it comparable in its physical properties with the fluids of the body—is alone allowed to touch the patient. The surgeon's fingers and everything else that has been in an antiseptic are rinsed in such water, so that the *vis medicatrix Naturæ* is given a perfect chance, uncomplicated by local or general poisoning, or by the self-poisoning that follows on local destruction of tissue.

Much the most difficult problem remains, which is that furnished by the surgeon's own fingers, and is equally serious whether an antiseptic or aseptic operation is to be performed. His fingers cannot be put into the steam steriliser, nor boiled, nor kept in glass cases when he is not operating. Some surgeons operate in india-rubber gloves, whilst others find them intolerable. The evidence seems to show that the fingers can be effectively cleansed by the following of a careful and complicated technique, in which soap and alcohol, ether, turpentine, the nail-brush and carbolic acid may all play a part. The surgeon's fingers may receive as powerful and prolonged a soaking in antiseptics as they and he will stand. It is not they that have the after problem of healing; and, if the antiseptic is washed off, the patient's skin will not be disturbed by the rigour of the processes to which the surgeon's skin has been subjected.

Plainly nothing short of inexcusable ignorance or still more inexcusable dishonesty can account for the description of this method as in any sense whatever

anything but the perfecting and refining of antiseptic surgery—which is declared by its inventor and demonstrated by the facts to be a direct consequence of experimental research upon the lower animals.

Some further points of great interest remain to be considered. In the first place, there is the question of testing and checking the technique upon which so much depends. In the leading hospitals this is often now regarded as an essential part of the equipment and practice of surgery. A bacteriological laboratory is attached to the surgical department, and performs invaluable functions, of daily increasing importance. It is obvious that all manner of diagnosis will depend upon the findings of this laboratory, and diagnosis by surgical procedure—the making of a " diagnostic incision "—is now an everyday proceeding: made perfectly legitimate by the Listerian methods which safeguard the subsequent healing. But here I wish merely to refer to the uses of the laboratory in connexion with the aseptic method. The routine may be for the steam steriliser and sterilisation to be entrusted to a particular person, any of whose work may be at any moment checked by the sending of a swab or what not to the laboratory to see if any form of life can be found in it. Similarly the surgeon will test and check the preparation of the patient's skin and of his own, not to mention the sterile water and other aseptic but not antiseptic fluids employed —by sending scrapings, samples of dressings and so on, whenever he will, to the laboratory. And subsequently it may be possible for such a surgeon to demonstrate the effectiveness of his technique and place its advantages at general disposal, by publishing results to show that, say, during an entire year, or

in a series of one thousand consecutive operations, bacteriological examination of this kind has proved that no living microbes were present where they should not have been, and that the proof is completed by the perfectly aseptic course of the wound subsequently.

Be it observed, then, that not merely did Pasteur, creating bacteriology, permit Lister to create modern surgery and the revolution of forty years ago, but that to-day bacteriology works hand in hand with surgery every day. This close association between the practice and the science is more necessary than ever when aseptic surgery is practised, and serves even further to refute the most complete of falsehoods—that modern surgery has abandoned the principles of Lister.

That is indeed the most complete of falsehoods; and so clear are the facts that even an unscrupulous advocate could afford to admit to-day what must certainly be admitted—that the principles of simple cleanliness, which served Lawson Tait so well, come in practice exceedingly near the best aseptic surgery. And if surgeons nowadays obtain results which far transcend his, it is chiefly because their cleanliness is checked, and refined, and adapted by the bacteriological knowledge which the enemies of Listerism despise. For there are various kinds of cleanliness, and their relations and differences are all illustrated in this connexion.

Ordinary cleanliness may mean absence of visible dirt, or little more than that. In its best forms ordinary cleanliness is practically though not wholly identical with the cleanliness demanded by the surgeon. But there is always the distinction that perfect ordinary cleanliness does not necessarily mean *sterility*

—absence of living microbes. Thus, though good enough for all ordinary purposes, and very nearly good enough for surgical purposes, it just falls short of the surgical requirement. Nevertheless it is a precious thing ; and Pasteur and Lister have told us why it is a precious thing. The housewife's dislike of dirt, the clean person's personal fastidiousness—which have long been laughed at as tending towards the absurd and insane—are much more than justified by the revelations of bacteriology : and the difference between life and death daily depends for thousands of persons upon the assurance that surgeons and their assistants shall be a thousand times more fastidious than the fussiest housewife or the daintiest belle, being not only far cleaner than anyone else now existing, but far cleaner than any human beings ever have been in the past.

Surgical cleanliness is another thing than ordinary cleanliness ; and it may not look nearly so nice. I have seen a surgeon proceed to an operation with what appeared a thoroughly black thumb-nail of the original Adamic type. But he was careful to tell us that the dirt was " clean dirt "—being in fact sterilised cobbler's wax. " Clean dirt " is a phrase full of meaning for the hygienist and the surgeon, for surgical cleanliness is simply absence of living microbes, no more and no less ; and to realise that the *only* objection to dirt is the life it contains is to appreciate to the full the profound and ever necessary philosophy of the saying that matter is only dirt in the wrong place. It may be added that hygienic training gives one, and will in due course give us all—for hygienic training will be part of general education before very long, and I hope to live to see and hasten the day when no educated person will buy such a book as this,

any more than a copy of the alphabet—a trick of distinguishing the dangerous from the innocent forms of dirt, quite otherwise than most of us judge of dirt, by its colour contrast with its surroundings, and by nothing else. Thus, to take the first instance that occurs, one may wash one's finger, accidentally stained with a drop spilt from a cup of chocolate, by licking it : but for the surgeon this would be to substitute, superficially, for surgical cleanliness (as the chocolate has been boiled) surgical dirt (as his saliva has not). It need scarcely be said that the operator must not touch his face nor adjust his eye-glasses, much less allow his fingers to come into contact with the abundant " flora " of his mouth.

And, thirdly, there is chemical cleanliness, which is neither ordinary cleanliness, nor surgical cleanliness, but is related to both. For the chemist anything is clean which contains no trace of any chemical. Obviously, if one is examining for the presence of sodium in a solution, it must not be first poured into a test-tube which contains traces of any sodium salt—such as are practically omnipresent. And if the test-tube does not satisfy this condition it is chemically " dirty," though it be " spotlessly clean " for the housewife, and perfectly sterile or clean for the surgeon. Thus we see that the aim of aseptic surgery is to leave the patient's skin not only surgically clean, but also chemically clean so far as antiseptics are concerned.

Of the results of aseptic surgery we may say that they are the results of surgery at the present day, for aseptic methods are practised whenever they are applicable.

Something may be said, however, of the *pros* and *cons* in the controversy between the extremists and

their fellows, as to the advantages of extreme rigour compared with a more generous interpretation of the meaning of asepsis. As in so many other cases, we find that some surgeons adhere rigorously to the letter of the law, and take endless trouble to prevent even a drop of boracic acid solution from reaching the patient, whereas others are well content to observe the spirit of the law, without troubling with so much exactness as that. These last may argue that their technique is slightly safer, being less hazardous in its dependence upon the nice and punctilious observance of many conditions, by operator and assistant. In fact, however, the best modern surgeons, though they may differ quite widely in various details, do so completely satisfy the requirements of Listerism that we who do not operate and are not called upon to operate neither are capable of judging nor are required to.

But the controversy intimately concerns us when we transfer it from the sphere of surgery to the question of the preservation of food. To that most important question a few pages must be devoted, in statement and illustration of the thesis that at present we are in the stage of antiseptic practice in this regard, and that we must as quickly as possible pass on to the stage of aseptic practice, which has advantages over the antiseptic method, in this universally important question, no less decided than in the sphere of surgery. The increase of population, and its increasing urbanisation, yearly add more urgency to the question how we are to be fed ; for the needs of the citizen of London or New York are those of *Homo primigenus* in all fundamental respects, and every extension, in time and space, of the distance between a man's mouth and the place where what

he eats is found, demands more knowledge and skill, if this tremendous adventure called civilisation is not to fail in our own day as it has invariably done in all that are past.

It is, indeed, curious to consider how mankind persists in controverting the natural order. Woman is the head of the Mammalia, and modern woman, losing the most unselfish of her functions, is ceasing to be a mammal. And man, the paragon of animals, is becoming a vegetable in a fundamental respect. For one of the major distinctions between the animal and the vegetable is that the latter, living on food which is practically everywhere, is fixed, whereas the animal, unable to feed on the common inorganic constituents of air and soil, and requiring highly specialised and relatively scarce forms of diet, is essentially locomotive. Our anatomy and physiology, our bodies and our senses, our functions and our appetites, are characteristically those of a creature made to move in search of food—to climb, to root, to run, to catch. But civilisation takes no note of all that, and the citizen no longer moves in search of food. He has become a sedentary organism, like a plant; and his food has to be brought to him, as the wind brings the plant's airy diet. But this involves a whole host of difficulties for which there is no natural provision, civilisation being in a sense super-natural as man is certainly the super-animal. And it is evident that this question of the preservation and carriage of our food, which really should be consumed in a fresh state as and where we find it, is one of the very first which must be satisfactorily answered if anything at all like the modern citizen is to persist.

As my purpose is by no means to discuss the whole

question, but rather to show its parallelism with the developments of surgery and its dependence on the same principles, we need consider only one food, but as that food is milk, and as septic milk (in the widest sense) produces the commonest of surgical diseases, namely, surgical tuberculosis, we shall certainly not wander too far from our main subject.

If the issue between the aseptic and antiseptic methods in the treatment of surgical tuberculosis is to be solved in the only perfectly satisfactory way, which is by the abolition of the disease, we must properly decide the issue between the aseptic and the antiseptic methods in the treatment of milk and its various products, such as cream and butter. At present we are in the crudest antiseptic stage in this respect. The milk is often drawn from a tuberculous udder, and even if it be not, it is certainly contaminated with many microbes, some of them capable of doing grave injury, long before it has travelled far on its long and trying journey, with ever so many changes, from the cow to the consumer. And thus the only way of getting it to its journey's end with any practical success at all is to treat it by the antiseptic method, as vigorously as the law may allow. Thus formalin and salicylic acid and boracic acid and other drugs, known and proved poisons one and all, are regularly added to the milk, and what we swallow is milk, dead microbes, and the poison which killed them : which poison then proceeds to go as far as its nature and amount require in the direction of killing us. When the fundamental problems of civilisation come under serious review by persons who know that they must be solved, and who are thinking not of the next election, but of the next generation, the whole question of the employment

of what are euphemistically called preservatives in food will have to be attended to : and we shall recognise the necessity for the universal employment of the aseptic instead of the antiseptic method. This will be in wise imitation of the development of surgery, and it will lead us a long way in the direction of a better thing than even aseptic surgery, and that is the disappearance of surgery and surgeons altogether.

Here and there are the beginnings of the aseptic method in the treatment of food ; and they will rapidly grow as we come to realise that the better we treat our food the less need will there be to treat ourselves. We shall soon see the end of such open imbecilities as the exposure of bowls of milk to the air, with its street-dust, containing what street-dust contains (which may be swallowed but must not be said), and its flies, and their feet, infected by the appointed food of flies—which, also, is best left undefined. Somewhat later, such other reforms as demand neither intelligence nor expense of the reformed will be effected—the *Daily Mail*, which one day decided to make us all eat the right kind of bread, could do this at a moment's notice—and later still we shall begin at the beginning, and institute practically aseptic milking, and aseptic transit, and abolish all preservatives from our milk and cream and butter, excepting only salt (which is a food), in the latter case. The aseptic method will in due course be applied to the whole of the food supply, not of course to the letter, but in essentials. Sometimes we shall have to compromise for safety, just as the surgeon sometimes must compromise between the antiseptic and aseptic extremes ; but in any case we shall effect great things

for cities and citizens. Merely by way of a concluding hint, it may be noted that no one is now able to say to what extent the disabilities of citizens and their children depend upon the dosage with boracic acid which is their daily and lifelong portion.

## CHAPTER VIII

### LISTERISM AND MOTHERHOOD

It does not occur to us, perhaps, to look upon child-birth as the equivalent of a surgical operation ; yet in all essentials it is so, and there are great and growing reasons why we should look upon the services of Listerism to motherhood as transcending all else. As the years pass, the scope of surgery, now steadily increasing, will still more rapidly diminish, since the patients will not be forthcoming. The disappearance of rickets and of surgical tuberculosis, and the attainment of the bio-chemical control of cancer, to take no other instances, will progressively and rapidly diminish the importance of surgery as a servant of mankind : here we celebrate a beneficent new art which will ere long, thank Heaven, be a lost art. But the necessities of birth will remain, nor can they ever be circumvented until, perchance, science abolishes death. We shall see in the course of this chapter, also, that a very important and fertile field for the present application of Listerian surgery depends upon the failure to apply the Listerian principle to child-birth, from which failure flow half the physical miseries of womanhood at the present time.

There are at least three special reasons why it is our duty to insist upon the importance of Listerism for motherhood ; and a writer whose life is devoted

first and foremost to the divine cause of Eugenics may well be excused if he insists upon those reasons before proceeding to review the history, state the lamentable present facts, and indicate the evident requirements, of this great subject.

The first reason is, of course, that truly stupendous and momentous fact, the fall in the birth-rate, which is proceeding with even greater acceleration, and will long continue to proceed, in all the civilised countries of the world; if for the moment we use civilised in the sense of less rather than more illiterate, other definitions being, of course, imaginable. The fall in the birth-rate is an absolutely inevitable consequence of what has been called, not without some show of justice, the greatest discovery of the nineteenth century, namely, the safe and efficient control of conception. As the knowledge has spread, the birth-rate has fallen, and it will have at least as much further to fall as the information in question has social depth to penetrate—which is indeed the whole depth of the social stratum from which the greater part of the present birth-rate is derived.

There are those in abundance who desire to "moralise this spectacle," and evidently the moralist, or the student of morality, has a notable object for contemplation in the fact that, everywhere, mankind desires the satisfaction of certain instincts out of proportion to the desire for their natural consequences. And when the censor turns student—a humbler and more arduous part, which he commonly thinks beneath him—he may profitably compare the relative advantages, in moral principle, and in social result, of infanticide and the control of parenthood; of a mercilessly brutal struggle for existence and its preventive amelioration; in a word, of irresponsible

and responsible, improvident, animal, and provident, human reproduction.

These studies will occupy the moralist for some time, and meanwhile the birth-rate will fall, and births will become proportionately and progressively more precious when they do occur, partly on account of their comparative rarity, and partly because, some day, the Eugenic ideal, as I have elsewhere formulated it, will be satisfied, and every child that comes into the world will be loved, desired and cherished in anticipation. Already the slow education of public opinion is beginning to take effect. Less than a decade ago, the general comments on the falling birth-rate, when new figures were forthcoming, took the form of protest and indignation and surprise. The figure for 1910 was, of course, the lowest on record, as will be the figures for 1911 and 1920. But it was noticeable that the commentators accepted the fact: and the time is at hand when we shall realise that, in the circumstances, our business is not to deplore the inevitable but to remedy what can be remedied. That is no inconsiderable matter, and I here desire to draw special attention to a fact which will one day be duly appreciated, and the sooner the better. It is that the application of Listerism to obstetrics, not in the lectures or practice of leading obstetricians, but in the homes of the people, is demanded not only in the interests of mothers as mothers and babies as babies, but also in relation to this great world-phenomenon, with its formidable menace to the destiny of modern civilisation.

It has been proved by Drs. Newsholme and Stevenson, and by the Fabian inquiry which we owe to Mr. Sidney Webb, that the fall in the birth-rate, whilst partly due, as such a fact must obviously be

due, to a host of minor influences, is essentially due to a voluntary decline in the fertility of married people. That is primarily the business of those people, to which they are attending and will attend: after our objurgations as before them.

But it must be realised that, supposing this new factor were obliterated, the birth-rate, of course much higher, would even so be by no means as high as it ought to be—whatever that phrase exactly means—if it were not for *the accidents of maternity.* It is not to be asserted that the prevention of these accidents would now compensate wholly for the fall in the birth-rate due to the voluntary factor; but no one who is acquainted at all with the facts of maternity among the poorer classes will question that the prevention of these accidents would mean—and will mean—a very substantial addition to the birth-rate forthwith. For there is an involuntary sterility as well as this, practically new, voluntary sterility; and every obstetrician and gynecologist knows that the "one-child sterility" which is its commonest form, is usually due to the lack of due Listerian obstetrics when the first child was born. What applies to childbirth applies equally—and perhaps more frequently—to miscarriage. The reproductive career of the patient is ended, often before a single child has been contributed to the future, because the work of Pasteur and Lister is not yet made available. To this let us add the number of those who actually die after childbirth, owing to the same reason, and we shall begin to realise that one of the most evident and necessary and urgent remedies for an inadequate birth-rate is Listerism. How many of my readers have ever so much as fancied any connexion between these two subjects? Which of the bishops, and

politicians, and publicists, and censors-in-general, who daily direct and harangue us, which of the "statesmen" and Imperialists who scorn social reform as "parish-pump politics," has yet so much as discovered Listerism as a part-remedy for the falling birth-rate, to say nothing of any attempts to apply it? Yet what might not be done if for the flood of daily rubbish poured forth on this subject—compared with which questions of the "Constitution" or "Church and State" are mere parlour-games—we were to substitute a little action for the saving of the nation's mothers from dirt in their creative hours!

Let us consider now the second of the special reasons why we must insist upon the importance of Listerism for motherhood—if we may not be content with the overwhelming general reason that Listerism serves the most valuable members of the community when they are most in need of service.

This special reason is that we must do what we can to counteract the alarming present tendency of the women most desirable for marriage and motherhood to decline these functions altogether, or if not both of them, at any rate the second. The time is at hand when, if we do not actually require to *tempt* such women to undertake their great social function, we most certainly do require to remove such objections and risks as may be removed. If we want for motherhood the very finest and most valuable women, who will rightly look upon themselves as valuable, we must do what may be done to remove the risks of this supreme profession. In general, the physically risky occupations are those discharged by the least valuable and most easily replaced members of the community; but motherhood is at present in the remarkable position that, in risk to life and health,

it far exceeds coal-mining, if not even the trades concerned with the sale of alcohol, whereas, unlike these occupations, it demands and has a sacred claim upon the rarest, highest, and most valuable qualities of mind and body that a human being may possess. This is, in some sense, an anomaly, which it is our evident duty to remove. Listerism transforms the conditions of motherhood, and lowers the attendant risks to an extent which is beyond calculation. For the Eugenist or for the enlightened patriot—they are the same person—and for those who desire the best fruition of our womanhood, it is now and henceforth a duty to make motherhood a safe as well as a supremely honourable and honoured profession. In later pages we shall see how far our national service for the care of maternity yet is from fulfilling this evidently necessary condition.

To the third of the special reasons for the application of Listerism to maternity a few words must finally be devoted, before we proceed to the history of our subject. It is that maternity makes special and increasingly onerous demands upon the women of the higher races. In general, the higher races have larger heads, not only in maturity, but at birth ; and this is one of the reasons why maternity is more exacting for the civilised woman than for her savage sister. Doubtless she has a wider pelvis, but even so there is a constant struggle, so to say, between the tendency for the size of the head to increase and the tendency for the capacity of the maternal pelvis to increase ; and the head, with all that it may be capable of and all that depends upon it, is ever at the mercy of the calibre of the bony ring through which it makes its amazing entry into the world. Now the risk of infection and consequent inflam-

mation, during or shortly after childbirth, is directly proportional, other things being equal, to the amount of local injury, including the devitalisation due to mere pressure, done by the child's head in its course, and this injury will evidently be greater in proportion to the size of the child's head. Thus, the larger the head, the greater the need for Listerism; which is familiar doctrine in the ears of every doctor or midwife or obstetric nurse, who all know well that the birth of a boy, his head being bigger, involves greater risk and needs more care, than the birth of a girl. All mothers require Listerism, but the mothers of boys, and especially of boys born in a first confinement, require it pre-eminently. Let us now see what Listerism has already done for motherhood, and we shall begin to realise what it will do.

But first there is a possible criticism of which it is difficult to write without some impatience. This is the very familiar and, at first sight (which is no sight) plausible, objection to all improvements in sanitation or hygiene, in diet or medicine, that our ancestors "got along very well without all these new-fangled scientific devices." It is somewhat similar to the argument that our grandfathers and grandmothers—the critics are doubtless speaking for themselves—drank freely and were very hearty and successful people; then why not we?

And the reply to it is the same. We have half the death-rate or less, that our ancestors "enjoyed," and are in our prime at ages which they never attained at all, and the less we drink the longer we live. So also with the application of Listerism to motherhood.

The argument of the objector gains immensely in *à priori* force in this case, since motherhood is unquestionably a natural function, and, as such, should

stand in no need of artificial assistance. But we forget that cities and houses are not "natural" in that sense of the word, and that we ask the mother to perform her "natural" function under intensely "unnatural" conditions, involving risks to which the primitive mothers of our species were doubtless not exposed at all: so to say, there were no cesspools in the Garden of Eden.

Such is one answer, and a very important one, but it is not the answer which was first in my mind to set down. That is the answer provided by the maternal death-rate in the pre-Listerian days when they "got along very well without your boasted science." They did not get along very well. On the contrary, they fared very ill. We are the children of the survivors; just as we are those who escaped the infant mortality which is none the less a real and immense fact. The argument against the new-fangled notions, which is supposed to be derived from the days before their dawn, is not merely a bad argument for that side; it is the best argument for our side. And sometimes one may be excused for wishing that it were possible to transport these arm-chair critics of science for even one hour into those "good old days" of which they write, and to which one can only apply the admirable pun of Disraeli—they were the palmy days that had no date. Let us see, then, what were the facts of motherhood in pre-Listerian times.

Here we must at once distinguish sharply between two fundamentally different things, childbirth uninterfered with, and childbirth as it occurs under the care of midwife, nurse or doctor. Natural childbirth, as we may observe it amongst primitive peoples—though the midwife is often to be found

there too—or amongst the lower animals, is very largely protected from infection. Nothing occurs to introduce it, and the trend of events is towards expulsion rather than introduction. The patient is not confined in infected surroundings, she is not in the same ward with other patients who are infected, and, having no attendant at all, she runs no risk of danger from doctor, midwife, student, or nurse, who may have come straight from opening an abscess, or from the *post-mortem* room, or the dissecting-rooms. And further, anyone who will consider the anatomy and physiology of the function of childbirth from the point of view of Listerism will perceive that the natural obstacles to and provision against infection are various, efficient and almost insuperable. It is only with human interference that the risk begins.

Why, then, interfere ? some may say. The answer is that, whatever may be the case of the savage woman, civilised woman and her child are the better for proper attention at this time. The confinement, indeed, should be the most important date, merely, in the course of medical supervision extending from many months before it to some time after. It would merely blur the main outlines of this chapter if we were to set forth, in adequate detail, the reasons why obstetric science is called for, notwithstanding that childbirth is a normal function. It must suffice merely to say that never was normal function so near the pathological as this is.

Let it be assumed, then, that the obstetrician, whether doctor or midwife, is required in greater or less degree. With him or her there enters not merely a safeguard or possible saviour of mother or child or both, in many common circumstances, but also a most substantial risk. Or rather, one should say,

there did enter, and may enter, a most substantial risk : but Pasteur and Lister have revealed the facts, and so far from this special risk now attaching to good obstetrics, it lessens the naturally very slight risk of infection.

It was the very profession of the attendant that constituted the bulk of the danger ; it was the very fact that the lying-in hospital was a lying-in hospital that made it dangerous for the lying-in woman. One does not take a sufferer from, shall we say, varicose veins, and treat him in a small-pox hospital. But we did take women who were *not* suffering from surgical inflammation, and put them, at the very time when they were to undergo a wounding (a natural wounding, but that made no difference) beside patients who were suffering from this terrible infection. And thus, if things were risky in ordinary practice in the patients' homes, and if there was an obvious danger in the carriage of microbes to the susceptible, the risk was vastly greater in maternity hospitals.

It could often be shown that, with strict and literal accuracy, these hospitals were more deadly than the battlefield : the proportion of those killed in giving life was higher than amongst those who went forth to take it. It was said in Paris in 1866 that " women of the lower classes looked upon the *Maternité* as the vestibule of death." And well they might, for in January and February of that year there were twenty-eight deaths out of one hundred and three cases—one mother in less than every four was killed. Mere decimation is nothing to it.

All honour to the few who fought against such things. Amongst them was Oliver Wendell Holmes, himself a physician and anatomist, who protested against the appalling mortality of childbirth in his

own time and place; and earned the customary measure of gratitude awarded by their professional contemporaries to medical reformers.

Far worse, far more tragic and far more instructive, is the case of Ignaz Semmelweis, the tragedy of whose life, as Mr. Stephen Paget has remarked, cannot be told too often. It teaches the history of this subject, it illustrates the everlasting conflict between authority and innovation, and by its pathetic end, scarcely more than a decade before Pasteur's great detection of the mothers' microbic enemy, it enforces afresh the truth that he alone discovers who proves.

Semmelweis began to work in the maternity department of the general hospital in Vienna in 1846. He was only twenty-three, and in less than two decades he had died insane. There is nothing more poignant in the history of medicine than the record of those years.

Things were very bad when Semmelweis was appointed, and had been for many years. The mortality amongst the mothers from child-bed or puerperal fever ranged from 5 to 16 per cent. But it had a special distribution. Here I cannot do better than quote three paragraphs from Mr. Stephen Paget's admirable account :—

> " There were two sets of wards in the maternity department. The one may be called Clinique A, and the other Clinique B. For many years the mortality had been the same in each. In 1841 a change was made : Clinique A was assigned to the teaching of students, and Clinique B to the teaching of midwives : and so soon as this change had been made, the mortality in Clinique B became less,

but the mortality in Clinique A did not. Commissions of inquiry were held and in vain. It was suggested that the foreign students were somehow to blame, nobody knew why ; and many of them were sent away. Still the deaths went on. Women admitted to Clinique A would go down on their knees and pray to be allowed to go home ; almost every day the bell was heard ringing in the wards, for the administration of the Sacrament to a dying woman. People talked about atmospheric influences, and overcrowding and the tainted air of old wards, and the power of the mind over the body : and Semmelweis set to work.

"He observed that cases of protracted labour in Clinique A died, almost all of them ; but not in Clinique B. He observed also that cases of premature labour, nearly all of them, did well, whichever Clinique they were in ; so did those women who were delivered before they came to the hospital, and were admitted after delivery. He observed that a row of patients, lying side by side, would all be attacked at once in Clinique A ; which never happened in Clinique B. He tried everything : he altered the details of treatment ; he used various subterfuges to prevent one of the professors from examining serious cases ; he enforced this or that rule in Clinique A, because it was the custom in Clinique B ; he slaved away at the notes of the cases—and at last the truth came to him, by the death of one of his friends from a dissection-wound. He says, 'My friend's fatal symptoms unveiled to my mind an identity with those which I had so often noticed at the death-beds of puerperal cases.' He saw now that the students, coming straight from the dissecting-

rooms, had infected the patients during examination.

"In May 1847 he gave orders that every student, before examining, should thoroughly disinfect his hands. But, though he had reckoned with dissecting-room poisons, he had forgotten to reckon with other sources of infection. In October of that year, a woman was admitted who had malignant disease; of twelve women examined after her, eleven got puerperal fever, and died. In November, a woman was admitted who had a suppurating knee-joint, and eight women were infected from her and died. Therefore Semmelweis said, 'Not only can the particles from dead bodies generate puerperal fever, but any decomposed material from the living body can also generate it, and so can air contaminated by such materials.' Henceforth he isolated all infected cases, he enforced the strict use of disinfectants: and the mortality in Clinique A, which in May 1847 had stood at 12·24 per cent, fell in December to 3·04, and in 1848 was 1·27."

The rest is tragedy. Semmelweis was opposed by his chief and, despite a good beginning to its fame, his work was discredited, and the University authorities turned him out of his post, the hospital and Vienna. Year after year his enemies gained in power; his work could not be verified by proof; and in 1865, after a few last weeks in an asylum at Vienna, he died.

And after his death followed those of countless women all over the world whom he had just failed to save. We have seen the figures from Paris in the sixties, and they are typical. Not until 1877 did the

Listerian method come into use, and in the following year Pasteur showed that the too familiar streptococcus—the round-celled microbe which grows in adherent chains—is the cause of puerperal infection. "One day," says Roux, "during a discussion on puerperal fever at the Academy of Medicine, one of his most renowned colleagues was eloquently discoursing upon the causes of epidemics in maternities. Pasteur interrupted from his place—'What causes an epidemic is none of all that: it is the doctor and his assistants who carry the microbe from an ill woman to a healthy one.' And when the orator replied that he much feared one would never find this microbe, Pasteur went to the blackboard, and drew the organism with its row of grains, saying, '*Tenez, voici sa figure.*'"

A generation has passed since that day, and there are no more epidemics in maternities. As a medical student and as resident physician to the Edinburgh Maternity Hospital I had a fair share, even during my brief days of medical practice, of obstetric observation, comprising some of the worst slums, and perhaps the most famous slum population in the Empire—that which started, after the Boer War, our interest in the national physique. But I *have never seen* a case of puerperal septicæmia, much less a death from the disease. Like pyæmia, it is become a name to those whose observation has been confined to obstetrics of the modern school.

In this case also, as we might expect, the evolution of practice has followed that of operative surgery. In 1877 carbolic acid reached the Paris Maternity Hospital, but we may be very sure that much less is used there now than then—though it is more valuable than ever. Antiseptic midwifery was the

first stage. Semmelweis had practised it in the 'forties, but his arguments were empirical only, and could not prevail against the prejudice, self-interest and conservatism of the day. The identification of the fatal microbe, and the study of its habits and modes of conveyance, together with the success of antiseptic surgery, led obstetricians to employ the methods of primitive Listerism, with immediate and striking success. Powerful antiseptic solutions were in demand, of carbolic acid and perchloride of mercury, and the copious douching in favour for other purposes could readily be adapted to the antiseptic idea.

And now is the age of aseptic midwifery. Normally the attendant has to deal with what, from the surgical point of view, is the exact parallel of an operation upon unbroken skin—say for the straightening of a rickety limb. Nature is the surgeon, and she makes her aseptic wound for her purpose, as the surgeon would make a wound with the knife for his, and in either case, if infection occurs, the operator put it there. There are imaginable and even possible exceptions, but they may be wholly ignored. If, then, the patient be uninfected in the first place, the use of antiseptics will tend to injure her living tissues, and will find no enemies of hers to kill. They must therefore be used only if and when there is reason to suppose that infection has been or may have been introduced. Otherwise only sterile lotions—of which boiled water or "physiological salt solution" is the type—must be permitted to come in contact with the patient's tissues, or at any rate those tissues of which the vital task of healing is about to be required. Under these conditions we may almost achieve the remarkable feat of reproducing, rivalling, if not sur-

passing, in the modern city, the simplicity, safety and ease with which we may doubtless credit primitive natural childbirth. The patient's temperature does not rise, her pulse is even slower than usual, everything takes a rapid uninterrupted course, not towards health, for health has indeed never been departed from, but towards repair. There are no disastrous *sequelæ* of any kind. The mother is normal again in every way, and her reproductive career is not interfered with by any displacement, or relic, or enlargement or congestion. The absence of fever, and of the poisoning of which the fever is merely a symptom, greatly reduces the likelihood that the chemical or bio-chemical strain of pregnancy and childbirth will lead to mental disturbance. Very few members of the general public are at all aware how common and how important is puerperal insanity—a major factor in the statistics of mental alienation. This is doubtless of complex causation, like all other vital phenomena, but there is no doubt whatever that, other things—such as heredity—being equal, the occurrence of puerperal infection will often cause puerperal insanity, with all that that may mean, including possibly infanticide and suicide.

There is a branch of medico-surgical practice which is concerned with gynecology or the "diseases of women." The term is very general, and comprises much. It is only in very small proportion, however, that the unmarried woman requires to consult the gynecologist. The great proportion of all gynecological cases, those which are treated in hospitals for women or the special wards of general hospitals, those which are seen in private by the specialist, those which are dealt with by the general practitioner of all kinds, including even the "sixpenny" and

" fourpenny " doctor, and those which receive neither treatment nor the pretence of it, are due to two causes. Of these, one is infection by a particular coccus, in general form not unlike the almost omnipresent cocci of original surgical inflammation, but nevertheless distinct and known as the gonococcus. This is an evil which does not concern us here, though when it is put an end to, it will be because the principles of Pasteur and Lister have been applied. The other cause is imperfect attention at childbirth, commonly if not invariably involving a greater or less degree of infection by microbes. These unfortunate patients pay a long and lamentable price for their motherhood—not always even actual motherhood, but often abortive—and this injury to so many individuals, together with its enormous cost to the philanthropic, has to be reckoned, besides the associated injury to the birth-rate, if we are to appraise the consequences of the failure to apply Listerism to a nation's midwifery.

" The obstetrician should be the cleanest man on God's earth," used to say one of my old teachers, Sir Halliday Croom, now Professor of Midwifery in the University of Edinburgh. And so he should. Let us see what the facts are and what they should be. It may be permitted to recount my own experience, which is both representative and comprehensive. I undertook the practice of a friend for a short time in a pit-village in Northumberland; saw the maternity conditions for some time in ordinary middle-class practice, for three months in Hungate, the worst slum quarter of York, for as many years in the Old Town of Edinburgh, including that unutterably degenerate and indescribable slum population which Professor Karl Pearson unluckily took

to be a representative sample of the working-class population when he desired to study the influence of parental alcoholism; and in the Edinburgh Maternity Hospital.

Here, of course, was the never-to-be-forgotten contrast, the memory of which dictates these pages, between the worst imaginable conditions for maternity, vastly worse from the Listerian point of view than anything to be found amongst savages or animals —and the best imaginable conditions, such as philanthropy, science, and the desire to uphold the reputation of the school where Sir James Simpson and Lord Lister taught, could provide. Sometimes one attended a labour outside, sometimes inside: often the merest chance decided whether any particular mother should face her crisis within or without, if it was not the case, indeed, that the married mothers usually preferred to stay at home, in what Mammon provided, whereas the unmarried mothers more often accepted what Love and Truth provided. Out in the night of Mammon the conditions were those of slumdom at its worst—say in the "Royal mile" between Holyrood and the Castle. Here were tiny apartments, windows grimy and incapable of opening, furniture occupying the place of air, dirt omnipresent, unwashed and reeking neighbours, useless, inquisitive, morbidly curious, rich with all manner of infection, consuming the hopelessly inadequate supply of unchanged air, and substituting for it the products of their respiration, skin and clothes. The mother like unto them, and previous children promising the same characters for years to come. The father almost certainly intoxicated, that is to say, having his vital functions more or less impaired by a present dose of whiskey, and the mother freely partaking also,—

and thus contriving to dose the child before ever it opened its eyes on the darkness and dirt. (It is under such conditions that I have seen babies born drunk, as may be readily understood.) But whether or not it be absorbing alcohol from its mother's blood, the unborn child is at least clean—the one clean and unstained thing in all that filth and degradation. To its aid there would arrive the doctor and the two nurses—one for the mother and one for the baby—bringing to these inhabitants of "modern Athens," where Simpson and Lister taught, the chloroform for the mother and carbolic acid and alcohol for their own hands which represent, surely, the just and final antithesis to the forms of alcohol with which the place already over-abounds. Add only the picture of a violent knocking and entry at the door, just when the doctor is receiving the child's head into his hand, and into the world, and the necessity for high words and blows, because the whiskey-bottle has been left in the room. First receive the child's head into your hands, then fight its drunken father, then be sure to cleanse them of the filth before they go near the mother,—and then forget it while you live, if you can.

But that is not the worst, for it is incalculably ameliorated by the entry of the emissaries from the Maternity Hospital. What of the rooms where no such emissaries enter, where Mrs. Gamp still prevails, applying as much alcohol to her stomach as the Listerian obstetric nurse applies to her skin? The truth is that, in Great Britain, very much less than half of all the maternity cases yet receive proper care, or rather, one should say, the chance of proper care. The rest certainly do not receive it, and though the resources of Nature, even under the

most unnatural conditions, are marvellous, large numbers of these mothers suffer in consequence. Some thousands die every year from puerperal fever, due to infection by the hands which have come to help them, and a vastly larger number are left with ailments which in many cases are lifelong.

But a tiny fraction of the mothers who are exposed to such conditions as I have attempted to describe are fortunate enough to find their way into a modern Maternity Hospital of the first rank. We have seen what maternity hospitals were, and why. But nowadays they are practically surgical hospitals where every case is a major operation and where the conditions must be appropriately complete in their Listerian provision. The delivery-room is simply a surgical theatre of the first-class as regards air, light, rounded angles, tiled walls and the rest. Nowhere in the world, nor in any other sphere of existence, will you find a greater contrast than that between the room in the slum and the room in the hospital. Save for the presence of walls, floor and roof in both cases—and these are as different as can be—the two apartments are at the absolute extremes, every feature of the one directed towards death, every feature of the other calculated for and directed towards life. In order to point the contrast as it really is, one would have to describe in detail a modern surgical theatre, the precautions as to those who may enter it, the kind of provision for spectators, the washing of the air before admission and so forth. It is all quite different from a slum, but we must wait for a later chapter to describe it.

In this theatre not merely normal confinements are superintended—with the irreducible minimum of examination and interference, all rigorously aseptic

—but also the accidents and exceptions of maternity are dealt with. All manner of operations require to be performed, possibly at very brief notice: but the conditions for them are present, and the mother who would certainly have died in the slum may be saved. The possible quality and demands of obstetric surgery may be indicated by the case of what is called Cæsarean section, where the child is born by an abdominal section—the only means, in such cases, whereby the terrible dilemma of sacrificing either mother or child to the other, may be avoided. This truly magnificent achievement is in our own day one of the supreme triumphs of Listerism, and there are cases where the surgeon has felt himself justified in performing the operation without interfering with the possibility of future occasions, and where one and the same mother has had three living children brought into this world in this astounding fashion. But it is indeed only the niceness of the layman's palate that prevents me from illustrating, in many almost incredible ways, the measure of what the science of midwifery, thanks indispensably to Lord Lister, can now perform for motherhood.

Now it is very certain, if we recall the contrast between the slum-bedroom and the hospital theatre, that if one of them is right the other must be very wrong. "Yes, no doubt it is," some will say, "but we must take the world as we find it." That despicable phrase is the motto of the impotent and the forgotten in all ages: let us see to it that neither we as individuals nor yet the civilisation we confess be of their number. And let us realise, sooner rather than later, that the claims of Love, advocated perchance not only by the wise, but also by the maudlin-

sentimental, by the fanatic, the impractical, the revolutionary, are in our own day reinforced by those of Science and of Patriotism as never before. It is not merely that every mother should have better conditions rather than worse: it is that, as Pasteur and Lister have proved to us, the difference between conditions is not one of better and worse, but of right and wrong, safe and fatal. The contrast is not merely æsthetic or sentimental, it is the contrast between food and poison, between oxygen and carbonic acid. It is not "Providence" that kills the puerperal mother, it is simply pus; and we who know where pus comes from and how it may be avoided, are responsible. If you push a baby over a precipice and it is killed, your reference to the "inscrutable decrees of Heaven" will not prevent your arrest. If the dirty attendant pushes pathogenic microbes into the maternal passages before, during or after childbirth, and death follows, that is the work not of Heaven but of Earth; and it is our immediate business to see to it.

"That it may please thee to preserve all women labouring of child, we beseech thee to hear us, good Lord." Such is the petition which, for centuries, has been uttered by countless voices in thousands of churches. The numbers of those who echo it are falling and will long continue to fall: but as we cease to petition we shall work. If it was ever true that "*Laborare est orare*," it is a thousand times truer now. The preservation of women labouring of child depends upon the practice of aseptic midwifery, far beyond all other things. Men are ceasing to attend church; but they will shortly begin to pray by working, and then Pasteur and Lister, the earthly Providence of mothers, will preserve all women labouring

of child, as they were never preserved before: and even the women who still join in that beautiful petition are learning, after church-time, how to sterilise their hands and thus do their duty of preserving all women labouring of child. It is many years since I joined in the responses to that lovely Litany, of which a phrase, entirely misunderstood in my boy's mind,* has been somehow treasured there, and the words of which I have just verified. But indeed it is amazing to read those petitions now, and observe in how many cases we are doing what we have so long prayed for. "Young children" are interceded for, and I think of our infant mortality campaign and the simple, persistent, often indignant work which has taught the public, promises to enlighten even our politicians, and has already saved the lives of many scores of infants since Edward VII came to the throne and this one campaign of the "Peacemaker" was inaugurated. Verily there is room for reflection on the centuries during which that prayer has been uttered, and the death-rate amongst infants maintained—it never fell during the sixty years of prayer and indolence between 1840 and 1900—whilst one-third of the whole rate, very nearly, was abolished in eight years when we left the churches for *crèches*, and prayer for work.

The time has come for deeds in the matter of this petition too; we must forthwith "preserve all women labouring of child." It is the logical continuation of the infant mortality campaign; it is the clear indication afforded by the falling birth-rate; it is the evident demand imposed upon us by the fact that we now know what the authors of the Book of Common Prayer did not know; it is an evident

* I thought it referred to mothers tending fractious children.

field for philanthropy and it is fundamental patriotism.

Elsewhere I have advanced the recognition of the "Rights of Mothers" as a social principle which is fundamental and everlasting, because it is a biological principle and a necessity imposed by the conditions under which our species is reproduced. The argument of that demand is essentially economic, and does not here concern us, but a reference may be made to the underlying principle there enunciated, by way of introduction to the demand that for every mother throughout the world there must be provided, at the least, aseptic midwifery in her hour of peril.

Given the knowledge we now possess, the repetition of the Litany in our churches by those who do nothing for the nation's motherhood is an insult to God and man. When those beautiful prayers were written, they represented the sincere knowledge and belief of the age. The Litany does not pray for their obvious and inevitable effects to be averted from the acts of men; it seeks to mitigate or direct the acts of God. Year by year the boundary between man and God, thus understood, is moving: and God will continue to be banished from one sphere after another, until the many perceive what the wise few have always perceived, that he is either everywhere or nowhere. As regards the realm of health and disease, the dictates of elementary morality are clear. Two hundred years ago, it might be argued, the highest duty of all just and merciful men and women was to go to church and join in the petition to Heaven "to preserve all women labouring of child." Our duty now is to go and do so: this must we do, whether or not we leave the other undone; but if

we will not do it, for the sake of common decency let us not dare to join in the petition of the Litany.

The question may primarily be looked at from the economic point of view: it is not the most important, nor has it any real title to consideration at all, for it suggests that life is for gold and not gold for life; but it has to be recognised by the practical propagandist.

Lately in Great Britain we began the granting of Old Age Pensions, with an initial expenditure of some twelve million pounds per annum. Very little arithmetic is required to show what this sum would effect, applied to the nation's maternity. Round figures may be employed, and it so chances that they fit the memory very comfortably. A birth-rate of twenty-five per thousand (and even that is higher, I do not doubt, than we shall ever see in Great Britain again), in a population of forty millions, means one million births per annum. The figure is slightly in excess of the facts, but quite near enough for the purpose. Plainly twelve million pounds for a million births provides us with twelve pounds to dispose of on each, even assuming that the money was required in each case, high or low.

It is by no means asserted that we should withdraw Old Age Pensions, nor yet that we should proceed to spend twelve pounds apiece on each confinement, nor even that it would be wise, without paternal contributions, to undertake any State service of the sort. These are difficult questions, well worthy of discussion, but quite outside our present need. The points of the allusion to the pensions are two, and the first is that the money which would be required for the adequate care of every maternity case in the country is readily available: for Old Age Pensions

alone consume already at least as much as would be required, on a liberal scale, for due attention before, during and after every confinement in the land. The expectant mother might have a month's freedom from work, whatever her class, before and after confinement, and the provision of a Listerian nurse and of a thoroughly competent and decently remunerated obstetrician, of either sex, for twelve pounds or less. It is indeed no less than astonishing to discover how relatively trifling would be the cost of such a practice : and indeed, in general, what a very small proportion of the national income would be required for the vital purposes of the nation, compared with the huge sums which are misspent, wasted or worse. With one-twentieth part of the nation's annual expenditure on alcohol alone, it would be more than possible to provide due Listerian conditions for every mother who now goes without them.

But the argument may be stated more forcibly still. The State and the charitable between them support a large number of hospitals, wherein are to be found many women suffering from the after-effects of the lack of due attention at their confinements. Allowing nothing for the economic loss involved in these women's invalidism, nor in that of the women, similarly affected, who never enter hospital wards, we may well believe that the money now spent on the care of these cases would suffice to prevent them from occurring at all, and to save the thousands of mothers who are annually killed outright by puerperal fever. But presumably it would be " socialism " to institute a service for maternity, though it is not socialism to pay long and heavily and in large measure fruitlessly for the consequences of the lack of such a service.

The second point of the allusion to Old Age Pensions is surely no less evident. How better could one illustrate the difference between a provident and an improvident nation, between statesmanship and politics? Mothers and infants have no votes, many old age pensioners and many more who will some day qualify for pensions are amongst those upon whom politicians depend for their existence. Motherhood and infancy are thus ignored whilst old age is provided for. Yet nothing could be more evident than that, if a wise nation were compelled to make a choice between provision for old age and provision for infancy, it would prefer to begin at the beginning, in the belief that rightly to provide for infancy is to lay the foundations of an old age which can provide for itself. Abundance of money, as we know, is available: we need merely a tiny fraction of that which is at present spent in wasteful or disastrous ways. The granting of Old Age Pensions was, of course, merely the beginning of an irresistible tendency, whereby more and more of the nation's total superfluity will be devoted to its localised needs. The needy will be dealt with, on the strictest political principles, in proportion to their voting power. That, at least, will be the sequence unless public opinion can be educated to the national importance of the silent demands which are made by maternity and infancy, and to which I am here attempting to give voice. No doubt the granting of votes to women, when it comes, will have the effect of directing legislation to the great national ends for which I plead: the evidence of New Zealand, with its woman suffrage, protection of maternity, and the lowest rate of infant mortality in the Empire, is clear enough on that point.

Meanwhile we must endeavour, in so far as our power lies, to press the question home. We are handicapped, unfortunately, by the tragic defection of many earnest women who are now working for the vote, the means, rather than the end, such as the reform here demanded ; and even more tragic is the indignant refusal of these women to admit the right of men to an opinion on these subjects. But women must be helped, whether they will or not : and the biologist and physician, who knows by what laws, never named in legislative chambers, the life of nations is maintained, must devote his first efforts to the needs of those chosen women who are giving of their lives, their energies, and their hereditary qualities, to the creation of the future.

At the time of writing, there are proposals in the air, soon to be incorporated in legislation, whereby illness is to be insured against, with the aid of a substantial contribution from the State. The word insure has two meanings, fundamentally opposed. We may take steps to ensure or make sure that such and such a thing shall not happen ; or we may take steps to ensure that, when it does happen, there may be some compensation. The difference is that between provision against the occurrence of fire, and fire insurance. The first belongs to the age of science, of prevision, of causation, of human control ; the second to the age of " Providence," " the inscrutable decrees of Heaven," fortune-telling, and all other forms of " ignorance in action," which Goethe called the most dangerous thing in the world. It is not possible to imagine any species of legislation more fundamentally vicious than that whereby people would be allowed to transgress every law of health until the due penalty came upon them, and were then allotted

so many shillings per week to spend upon the futilities of too-late doctoring, fortified with alcohol.

But consider the contrast between these pitiably blind proposals, belonging precisely to the same order of thought as the provision of soup-kitchens, and no more, for unemployment—and the proposals already made in various parts of the world, and here most earnestly supported, for insurance against maternity. Let us be clear about this. The case is surely clear enough in itself. To "insure" against preventable evils, instead of preventing them, is folly, alike for a nation or for an individual, and folly of the most mortal kind. To insure against, or rather to provide for, inevitable events, is wisdom, alike for a nation or for an individual, and wisdom of the most vital kind. I have elsewhere attempted to show that increasing prevision and provision of this kind is a mark of organic progress as we see it in animal evolution. The two inevitable events which transcend and determine all others, are death and birth: and if the simple principle which I have attempted to enunciate be valid, it is evident that the principle of insurance, whether on an individual or a social basis, must rightly be applied to those two cases—"life insurance," so called, and what we shall some day be no less familiar with, maternity insurance. Death cannot be prevented, and the wise man insures against it; maternity, the fountain of life, though it can be stopped up, must and will be welcomed and honoured in coming years, and so far from wishing to prevent it, we now desire to encourage it: plainly here is a case for insurance or provision.

This is not wholly a sociological treatise: but Medicine and Sociology are coming together nowadays, never to be parted, and the student of medicine

and surgery who cares not for their sociological relations is to me an incomplete and even a dangerous person. But for clearness of argument I must and do refrain from any discussion as to the vastly important details of maternity insurance, save only to reassert my long-held but ever-growing conviction that on no account whatever must we do anything which defies the æonian lessons of natural history by making it less instead of more responsible to be a father. In pursuance of this clear natural indication—of which the institution of marriage is, of course, the human expression—I earnestly hope that, in whatever scheme of illness insurance ultimately takes shape, exacting some toll from the workman, provision will be made for his wife, and her maternal illness, which stands over and against every other form of illness or disablement that can be imagined. Those make for death, this makes for life: and nothing is worthy of the name of statesmanship which does not recognise this deepest of differences. The needs of maternity are absolutely unique: we do not want consumptive or alcoholic workmen or bedridden senile paupers, or lunatics or the feeble-minded, and our duty is to prevent such things from existing at all; but we *do* want the woman labouring of child, we want her all the more, nationally, because she is being less wanted, individually, and because, as a community, we are at present vastly more successful in preventing birth than in preventing death; and therefore we must provide for her, and for her first.

The fall in the birth-rate is mainly voluntary, but it is by no means entirely so. No matter whether we consider the voluntary factor or the involuntary factor, the argument in favour of due Listerism for

all our motherhood is clear. The voluntary factor is by no means wholly paternal and economic, as many suppose. The mothers desire to limit their families, quite apart from the question of money, because child-bearing is heavy labour, and frequent child-bearing more than body and mind can usually bear. Therefore we must at least provide the very best conditions for maternity; and here Listerism does undoubtedly appear as in some measure the social antidote, so to say, for what is called Neo-Malthusianism. It offers the mother the practical certainty of safety, quick, easy, uncomplicated recovery, and total absence of disabling or painful *sequelæ* of any kind.

The involuntary factor of the fall in the birth-rate is smaller than the voluntary, and has been inadequately reckoned with since we came generally to recognise the existence of the voluntary factor. This last, however, as the name implies, is controllable; the other, outside any obvious control, may really be by far the more minatory of the two. It seems clear that involuntary sterility, definitely due to the mothers and not to the fathers, is steadily increasing in our highly civilised communities. A higher proportion of infants die from premature birth, involuntary miscarriage is certainly not diminishing, and there is the immensely significant indication furnished by the increasing incapacity of mothers to nurse their children. This I take to be an early symptom of reproductive failure. It means more even than that, as I have often said, woman is ceasing to be a mammal. It means that she is ceasing to be a mother: and what then? The reproductive system is *one*, we must remember. Part of it is for the ante-natal nurture, part of it for the post-natal

nurture, of the child : but womb and breasts are parts of a whole, are profoundly connected by nervous and by subtle, indissoluble chemical bonds ; and loss of function in the one case presages and indeed probably often accompanies, even already, loss of function in the other.

Here, surely, is another reason why maternity must be made as feasible and as safe as possible for those women who undertake it, and why, the possible mothers of the races becoming fewer, we must avert the dangers which now kill many of them every year, and disable for all future maternity many more.

This chapter is already of considerable length, and has included some discussion—in reality most brief and merely indicative—of questions which are not primarily surgical, and may seem to have little bearing on our subject. It might be argued with some force, however inadequate the present illustration, that the best service which a thinker can render is to show the connexion, the mutual dependence, and possibility of application, of things which appear independent and disparate. This is assuredly true in the natural sciences, and I do not see why it should not be true in sociology, which is of the same order as biology or physics, differing in no essential. Thus it might be that the sociologist can perform no higher service than to show the bearing of one fact of our social life upon another ; and to me it seems evident that the bearing of Listerism upon our falling birth-rate is notable and hopeful. If it really exists, it is certainly urgent, for the fall in the birth-rate, however familiar it may have now become, is really sensational and stupendous in its meaning. The hortatory, episcopal, truculently

moral school of critics have failed and will fail. There is no right course but one, which has only to be stated to be accepted. It is to honour, elevate, safeguard and purify parenthood; and in this chapter it has been sought to prove that Listerism may be and will be of high and indispensable service in this respect.

Thus the professing Eugenist, turning aside from his own subject for once, finds himself returning to it unawares. There is no getting away from parenthood, because there is no getting away from life and death. The gross need for surgery is going, one needs only the use of the most mediocre eyes to see the end of it; but motherhood must not go and will not go. When the day comes that finds the surgical instruments of to-day almost confined to museums, when surgery, notwithstanding its rapid but transient extension to all manner of hitherto exclusively medical fields, is confined, for lack of demand, to little more than cases of accident—Nature's amazing operation of childbirth will still be daily or nightly performed, and beside those beds, centuries and centuries of centuries hence, will stand Pasteur and Lister, still saving the mothers of men.

In Great Britain the Midwives Act has done something, undoubtedly, for motherhood; but that is only a beginning. We require a Public Maternity Service which, under some economic system or other, will provide the necessities formulated by modern Listerian obstetrics for every mother in the land, married or unmarried. This will, of course, be part, the most important and permanent part—for all other froms of illness are going—of the National Medical Service of the future, which will be primarily and mainly preventive, but will also deal efficiently

with the one form of illness which we do not wish to prevent.

[The foregoing is printed as it was written before hearing Mr. Lloyd George's epoch-making speech in the House of Commons (May 4, 1911). In a later chapter will be found some discussion of the possibilities in this new age now dawning.]

## CHAPTER IX

### LISTERISM AND WAR

We have seen how a practice designed to raise the patient's chances of recovery after amputation for compound fracture, has come to be applied to maternity, and has there proved no less beneficent than chloroform for the obstetric process. The needs of mothers were not in Lister's mind, nor in that of Pasteur before him, though the hour was at hand when Pasteur was to identify the coccus of puerperal fever, and the application of Listerism was for ever to remove the reproach that the world's maternity hospitals were more deadly than its battlefields.

Alike where men are slain and where babes are born, in their turn to slay or save, Listerism finds its work to do, and in the present chapter we may look at the place of Listerism on the battlefield or the ironclad, and in the military hospital. We thus return, in a sense, to the earlier and more obvious applications of Listerism, from such later developments as followed upon the discovery of its relevance to the needs of childbirth.

Yet in a sense the order of these two chapters is chronological. It is indeed true that the method first employed to lower the death-rate after amputations might be expected, having signally and instantly proved its powers in that direction, to find a place at once in military surgery above all.

Yet it was not so. The obstetricians, professional saviours of life, accepted the new discovery before the military authorities, professional destroyers of life. We have seen that carbolic acid entered the maternity hospitals in the seventies, at any rate in Edinburgh and Paris, but not until the latest great campaign in the world's history were the principles of Listerism fully, or even at all adequately, applied in war—and then in circumstances which the historian may well record with amazement.

Be it again noted, first, that the Franco-Prussian War followed upon the immeasurably greater event, the winning campaign in the agelong war between microbes and men, just long enough for the soldiers in that terrible struggle to profit, had the intelligence been available, by the work already done in Paris, Glasgow, and Edinburgh. Huxley pointed out that Pasteur's services to the industries of France sufficed to provide the entire indemnity which she paid to Germany after the war. But he did not point out, as he might well have done, had he lived to see the Russo-Japanese War, that if the work of Pasteur, applied by Lister, had been used by the French military authorities, not only might there have been no indemnity for France to pay, but she might have had one to receive. Neither side knew aught of what had been done; alike as regards infection with the soldiers' curses, typhoid and its congeners, and as regards the treatment of wounds, they fought as in the ages of darkness, excepting only that the wretched victims who required the surgeon's dirty knife were spared the immediate pain of operation, by the use of Simpson's chloroform. That was twenty-three years old, and had already penetrated the plugged ears of War Offices.

A generation or so later, President Kruger's threat to "stagger humanity" was fulfilled in the Boer War. As the countrymen of Pasteur were concerned in the earlier campaign, so the countrymen of Lister were concerned in the later. Certainly military surgery had been transformed in the interval, and the principles of Listerism were applied to some extent everywhere. At any rate the stage of antiseptic surgery was reached. Fellow-students of the present writer in Edinburgh, where the Listerian tradition was so recent and illustrious, left the class-rooms, Boers and British, to fight and to serve as surgeons and dressers, on their respective sides. A writer who witnessed the departure of friends, till then engaged in common and sympathetic study of the greatest art of Peace, for a field on the other side of the Equator, where they were to endeavour to blow each other's brains out, may be excused for stating his belief that seldom can the sun have witnessed a fouler business than that war. But at least there was Listerism practised by and for both sides, and if one were a biometrician, ready to accept as trustworthy *data* anything capable of disguise in figures, this would be the place to cite evidence showing that the practice of Listerian surgery was the one bright spot in all that hideous and futile business. Professor John Chiene, who had been Lister's right-hand man when the precious seed was beginning to grow in Edinburgh, did notable work of direction and personal practice in South Africa, and it would ill become a writer who owes to him the most inspiring and vivid Listerian teaching, and the first hearing of the great name, to question that in the Boer War Lord Lister's influence was beneficent and unprecedented in military annals.

But it cannot be denied that the pathological record of that campaign is a black one. The fault was not that of the military surgeons, nor the civilian doctors, nor the dressers, nor the many faithful nurses, Listerians one and all, who did their best through all that long tragedy. It lay with the War Office and the professional soldiers at whose mercy were the medical and surgical dispositions from first to last. Those who should know, for they served upon the spot, have assured me that the medical part of the campaign, lamentably inadequate though it was, at least surpassed the standard of the other services. Ignorance, arrogance, incompetence, and every other attribute favourable to failure, were our abundant portion in the Boer War. The men who could do nothing right in their own departments, every detail of which was supposed to be familiar to them, could scarcely be expected to recognise the importance of medical science, of which they knew nothing, and which their whole education, from public school days onwards, had taught them to despise. And, of course, things were bad enough, from the military point of view, without the addition of further worries and restraints and proposals from the medical officers. Thus it was that the most elementary requirements of hygiene and preventive medicine were defied; and it was not the fault of the non-medical persons concerned if the appalling records of the Crimea were not rivalled.

The British forces lost far more lives by disease than by the Boer bullets. The surgeons saved many lives and limbs which in any previous campaign in the world's history would have been lost. But if the principles upon which the surgeons proceeded had been acted upon as they should and could

have been, the total loss of life would have been halved, at the least, and the campaign ended, very likely, in half the time. For, as we have already seen, Listerism is only one application of the work of Pasteur. It is simply one department of applied bacteriology. The whole science of epidemics is substantially another. The conveyance of surgical fever from one patient to the previously clean wound of another is essentially one and the same thing as the infection of consumption by the inhalation of tubercle bacilli which a patient has expectorated, or of typhoid or dysentery by a similar process. In all these cases we have to deal with a parasitic disease spread by conveyance of the parasites from the sick to the sound.

All this, to the medically-trained mind, is simply alphabetical. The doctor has been taught, and has abundantly satisfied himself, that these are the fundamental matters of life and death, absolutely simple, perfectly certain, never to be forgotten or neglected for one moment in any circumstances whatever. When it is proposed to pitch camp on ground saturated with typhoidal drainage, this is to him a hideous and criminal insanity, practically equivalent to wholesale and deliberate murder. To the non-medical mind none of these considerations have any substantial meaning, and the medical protest is at once brushed aside, on account of overwhelming " military " reasons which a non-combatant cannot be expected to understand. In the immortal words of Lord Wolseley, " Medical advice is a very good thing—when it is asked for " : which is quite equal, in its way, to Lord Roberts' demand for military training, whilst recruits are being rejected on all hands, and the neglect of infancy damages for

life two-thirds of our population. The one soldier could no more see that medical advice is never more wanted than by those who are too ignorant to ask for it, than the other can see that you cannot have a soldier until you have first saved and served a baby.

To consider the question of military surgery and to ignore the two diseases, typhoid and dysentery, on the ground that they are "medical," would be simply to perpetuate a distinction which, as Pasteur taught us, has no real meaning; and we shall see, when we compare the Boer War with the Russo-Japanese War, that the principles of Pasteur's preventive medicine are equally applicable to the infection which is the vital factor in the one case as to that which is the vital factor in the others. In the Boer War we had a medical and surgical service, but it was designed to be curative, not preventive. The most limited intelligence can perceive the use of a doctor when a man is bleeding to death: but the subtle objection to pitching camp upon typhoid excrement, or drinking water into which a dysenteric hospital drains, requires something like a mind to perceive. Thus the death-rate from typhoid fever and dysentery amongst the British forces was monstrous and appalling: the Boer bullets were harmless by comparison. And this was amongst the representatives of the nation which led and still leads the world in the primary sanitation of its cities.

Broadly, then, it is true, as has been already suggested, that our medical and surgical service in the Boer War represented the stage of intelligent attempts to cure, and no more. There were beds and drugs and invalid food and nurses for the victims of the epidemics, but those in command knew little or

nothing of the prevention of epidemics, and the doctors had to do the little they could. And for the surgical cases, infected in various ways, there was the primitive Listerism of carbolic acid, perchloride of mercury, and the rest of the antiseptic paraphernalia : admirable, invaluable in its way, but always a last resort, always the expression of previous failure. What more could one expect in the surgery of wounds not inflicted by Listerian surgeons, but by the bullets of the enemy ? the reader may ask. We shall see.

For now we turn to the case of the next great campaign, the Russo-Japanese War — where the victory was not, as in our case, to the many but to the few. As everyone knows, this was by far the most bloody, by far the most colossal campaign in history. There are no precedents, at any rate in modern times, for the numbers engaged and the magnitude of the death-roll : and if we consider the size of ancient populations, we shall see that there never can have been anything to compare with that war. So huge and continuous was the slaughter that numbers, as numbers, told, not because big battalions beat little ones, but because of the drain upon the available manhood of the contestants. It was as in a lawsuit, where the longest purse wins. The Japanese had the enormous disadvantage of a relatively small population—the ravages wrought in which they are now, with the most remarkable expression of patriotism in history, repairing by means of a greatly raised birth-rate—and it is generally agreed that they could scarcely have held out any longer when at last peace was declared.

Now the Russian losses from disease of all kinds, from the infections such as typhoid and dysentery,

and from that other infection called surgical fever, were enormous. Nothing else could have been expected from the conditions of the campaign, and from the limitless ignorance, carelessness, alcoholism, disloyalty and corruption which marched forward, under the Cross of Christ, to conquer the "yellow monkeys." And if we contrast the Russian losses from these preventable causes with those sustained by their enemies from the same causes under identical climatic and seasonal conditions, we shall find ourselves bound to agree with Sir Frederick Treves, and confess that that war was won for the Orientals against the Westerns by the fact that Western science weighed down the scales on the Eastern side. Not less than Togo and the rest, Pasteur and Lister won that war for Japan.

For observe what was done. Everyone knows that the Japanese have adopted Western science, and not only prejudiced observers, unacquainted with the facts at first hand, but also such a writer as Lafcadio Hearn, have deplored the consequent changes that have come over the land of the Rising Sun. The Japanese have indeed abandoned many of their virtues in favour of our vices, and pity 'tis, 'tis true. But to admit that is not by any means to admit the argument of those who declared, especially during the war, that the Japanese had simply taken over from us the worst features of our civilisation and none other. Some said that it was the mark of the lowness and essential inferiority of this Mongolian race—which, by the way, has larger brains than the white race, whatever that may portend for the future—that, when they studied Western ways, they simply picked out the gunpowder and cannon, the warships and torpedoes, the instruments of war,

slaughter and death. It was not the useful or the beautiful or the noble that they wanted from the West, but the power to kill more efficiently, and that alone.

Well, of all the features of our Western civilisation, it is very certain that some will pass and some will remain; the world will not always want warships, but it will always want Listerism—at any rate so long as it wants babies. And if we were to attempt to anticipate the verdict of ten or five or two centuries hence upon our own days, we might well guess that the practical applications, in medicine and surgery, of Pasteur's bacteriology would take a foremost place in the critical estimation of the future. The nineteenth century gave us Pasteur, after all, as well as Krupp, and Koch as well as Bismarck. Now before we dismiss the Japanese for having valued and copied only our vices and our infernal devices, let us acquaint ourselves with the fact that they have also taken the work of Pasteur and Koch, of Simpson and Lister, and that they have already applied it as it was never applied before —else Russia might well be the suzerain of Japan at this hour. The new sciences of healing and saving were born in France and Britain, and developed there and in Germany: in two great campaigns since 1870 all three of these nations have been engaged, but it was left for Japan, for the "yellow monkeys" of the Orient, incredibly alien in temperament, tradition, and practice, to apply in war, for the conquest of a Western state, the principles which France and Britain and Germany have given to mankind. I know of nothing in the human record at all comparable to this most extraordinary and, at first sight, wildly inexplicable fact: and if ever

there lived a man wise enough to have predicted it, I should like to know his name.

In South Africa we reached the application of the primitive Listerism which faces dirty wounds and treats them with carbolic acid. That is antiseptic surgery. But, as has already been seen, there is a stage beyond that, where wounds are made clean from the first, and not only have no need of carbolic acid, but heal more rapidly and neatly without it. Quite so, the reader may reply, but what has that to do with the wounds made in war ? Unlike the rifleman, the aseptic surgeon cleans the patient's skin, mechanically and to some extent chemically, he purifies his own fingers and sterilises by heat the instruments with which he makes his wounds.

Yet there must be some heat, if we think of it, associated with a rifle-bullet. A very high temperature is produced by the explosion which sends it on its way. That, indeed, lasts but an infinitesimal fraction of a second. But during its passage through the air the rotating bullet is doubly sterilised : first, by the intense and irresistible scrubbing to which the friction of the atmosphere subjects it, and secondly, by the heat which that friction develops.

Thus we reach a very notable and remarkable conclusion, the due significance of which the Japanese were the first to perceive, as we shall see. It is that the instruments by which wounds are inflicted in modern warfare are sterile, like the knife of the Listerian surgeon. He sterilises his knife by heat, and so also does the soldier sterilise his bullet. Wounds in warfare are doubtless made in other ways, as by the sword ; but, as we all know, these other ways are

nowadays quite insignificant, as compared with the rifle-bullet. Other types of missile may be used for wounding warships, and will occasionally hit men; but in so far as modern war is determined by the wounding of men, the rifle-bullet is the one instrument we need consider: and it is aseptic.

However, the aseptic surgeon cannot content himself with the sterilisation of his instruments, for his success depends upon his control of everything which may infect the wound he makes; and if he were compelled to operate not only upon uncleansed skin but also through uncleansed clothes, he would certainly argue that no good could be expected from the previous sterilisation of his instrument merely. Nor would he be better pleased if the operation were to be so performed as to carry a portion of the patient's clothing into the wound, as on the point of a probe, and leave it there.

But that is what happens in war. The perfectly sterilised bullet strikes always upon unsterilised skin, and in the great majority of cases has to traverse a layer of clothing before it can reach the skin at all. If we attempt to make some allowance for the conditions of warfare, so far from bath-rooms and wardrobes, if we allow for the influence of heavy marching upon the skin, and if we acquaint ourselves—but it is better not to—with the soldier's allowance in the matter of underclothing—we shall see that not even the modern aseptic bullet can be expected to perform an aseptic operation under, or through, these conditions. And if, as often happens, some of the clothing is carried into the wound—there will be much need for carbolic acid as soon as it can be applied.

Consider now the case of a race which is asked to

enter upon a campaign for its national existence, and which is characterised by certain marked national peculiarities. In the first place, the Japanese are admittedly the cleanest people in the world : or at least they were, until lately, on their own soil. (It is no more possible to make sure of the maintenance of the Japanese cleanliness in contact with European civilisation than of Jewish sobriety under similar conditions, no matter how long nor how solid and continuous be the racial tradition in either case.) We all know that the Japanese crowd is non-odorous, even in still air and warm weather : and readers who have noses will recall Western experiences of crowds, of which the less said the better. This cleanliness is dependent, as all cleanliness must be, upon two factors, neither of which will be efficient without the other : the skin must be daily cleansed, and the clothing must be renewed with very great frequency. If any comforting consideration may be quoted for those who know but do not care for the flavour of, say, a carriage in the " tubes " of London, or its motor-buses, it is that probably the clothes are more active than the skins in contribution thereto. Now the Japanese is not only for ever bathing, but he keeps his underclothing clean : or at any rate he does and did except and until he meets us.

Generally speaking, it seems that we are teaching him to be more or less dirty ; but in the remarkable instance under discussion, we taught him to be cleaner than ever. Prior to the Russo-Japanese War the Japanese had, of course, adopted and begun to cultivate Western bacteriology as well as Western ordnance and alcohol. In the laboratories of Koch and Behring Japanese students had indeed added substantially to the progress of the science, as in the

making of the diphtheria antitoxin, the discovery of the bacillus of lockjaw by Kitasato, the identification of the bacillus of one form of dysentery, by Shiga, and so forth. Thus there was no question that they would avail themselves of the work of Lister. And here two national characteristics came to their service: first, their customary cleanliness, and second, their extreme attention to and supervision of detail. These two things are, indeed, the very best imaginable as preliminary possessions of him who would become a Listerian.

And so it came about that when a naval engagement was imminent *the Japanese sailors were all ordered to take a bath with some disinfectant and to don clean, freshly-boiled underclothing.*

It need not be asserted that they had all heard of Pasteur, and knew the theory of surgical inflammation. No doubt the orders were carried out in a quite unintelligent way; and I should incline to suppose that the spirit of their execution was religious rather than scientific. All cleanliness tends to be next to godliness in the psychological sense; it is a semi-religious ritual to make oneself clean at certain fixed hours, one feels. The Japanese sailor would feel this too; and there would be added to this natural psychological tendency the powerful motive furnished by the fact that these were the orders of his Emperor, Heaven-descended, for whom he was about to face death. I dwell upon this question not so much for its inherent interest, which is surely considerable, as for its bearing upon the possibility of applying the principles of aseptic surgery to our own forces. For the Japanese it was enough that these were the orders given in the name of his Divine Emperor, orders appealing to an

obedience rigorously trained from childhood, and to a loyalty which had the full force of a supreme religious imperative. Add the customary cleanliness of the race, and we realise that this process of preliminary sterilisation must have been carried out in no perfunctory way, but in the spirit and to the limit of the letter. Now it would evidently be by no means the same problem to enforce Listerism upon the British "Tar" or "Tommy," trained neither in cleanliness nor in detailed obedience, inclined to grumble at every order of which he does not see the utility, and entirely without the superstitious-religious factor of conduct which, beyond all things, saved Japan in her extremity. The problem for us must be solved through the intelligence, rather than the habits and the emotions, of the soldier, and before this chapter is concluded, that question must be considered.

Meanwhile let us observe that the Japanese sailor, thus prepared, stood up to meet his enemy in an entirely new kind of military armour. His predecessors of a generation ago, as one could observe at the Japanese War Office's Exhibit at the Anglo-Japanese Exhibition in London in 1910, had been arrayed in armour of wood and steel, chain and plate, after the fashion of soldiers in all ages: but he stood up in the full panoply of a carbolised skin and a boiled shirt. And thus he substantially guaranteed that the operations performed upon him by the Russian bullets were aseptic operations. We in South Africa had reached the stage of antiseptics; but if one recalls the attitude of our military authorities towards the most rudimentary and obvious hygienic precautions, it will be evident that something much more than ordinary military daring would have been required

of the surgeon who should visit the commanding officer with the proposal to give the men a carbolised bath and boiled underclothing previous to an engagement; more especially since we have it on the highest authority that "medical advice is a good thing—when it is asked for." The Japanese went all the way, applied our Listerism as it had never occurred to any of us, for all I know, to practise it, and as it certainly would not have been practised, even on Lord Lister's own recommendation—and the aseptic bullets, doing their fundamentally dirty work in at any rate the cleanest way, piercing sterile clothing, carrying only such clothing into the wound, or leaving only such clothing in contact with the edges of the wound, naturally exacted the lowest death-rate on record from inflammation and suppuration. The killing power of the modern bullet, under such conditions, is very small, and ranges little beyond the area of the brain and the heart, whilst wounds even of these organs may be recovered from. Not until the rifle-bullet—itself, as we have seen, a sterilised instrument—was allowed to perform its operations under substantially aseptic conditions could we discover the body's amazing power to survive uncomplicated wounding. After all, it might be argued that, except on the score of hæmorrhage, a rifle-bullet can scarcely approach a major operation of to-day in the extent of its injury to the tissues; and as for the hæmorrhage, the surgeon is at hand for that.

Evident though the importance of such aseptic technique in fighting must be, the ravages committed by typhoid and dysentery are more important still. To the general this may not seem clear, for he measures his success by the issue of battles, by the

gain or loss of positions and forts. But to the nation which is fighting behind the general, and to the onlooker, it is evident that if typhoid kills a thousand men, it is the same, in the long run, as if the enemy's bullets had killed them; for, as was conspicuously illustrated by the Russo-Japanese War, we are reckoning, in most campaigns, with the pressure of population as the ultimate driving force. The greater part of war, including the wars supposed to be religious, is a phenomenon of the expansion of races. There is a law of population-pressure which is strictly analogous to the law of gaseous pressure; and the pressure of population is the irresistible force of history. Now directly we conceive of war thus in biological terms we shall perceive that the soldier's problem is at least as much to save life as to destroy it. It is the pressure of population that must win in the long run, to whomsoever the glories of any campaign may go: and a Napoleon, carrying the flag of France everywhere, may so lower her population-pressure as to prove her ruin in the long run; which things we now see. Thus it is arguable that the really successful general of the future will be not so much the clever strategist or brave fighter as the assiduous champion of maternal education and health-visiting, *keeping babies alive*, which is the only fashion in which the real battles of nations are won.

The digression may be pardoned if it serves to make clear the vast importance to Japan of the means whereby she kept down the typhoid and dysentery death-rates in her great campaign. Space does not avail for detailed discussion of the argument; but it is a curious reflection that, whilst the French were sneering at the "yellow monkeys," the greatest Frenchman of all time was winning their war for

them : as he might have won the Franco-Prussian War, had his countrymen had the wisdom of the yellow monkeys in their own case.

It may be that some day the soldiers and sailors of Great Britain will be engaged again in a great war, perhaps for something not much less than her national existence. Contemplating such a possibility, and holding the estimate already made of the importance of the hygienic factor in modern war, I am evidently bound to consider the means whereby we may be enabled to do for ourselves what the Japanese did in their need.

It has been already hinted that, by a curious paradox, the very superstition of the Japanese enabled them to avail themselves of the services of science. Their duty was to obey the Emperor, the representative of Heaven, and his representatives : and if they were instructed in the demands of the technique of aseptic surgery, or if they were asked to pray or to burn incense, they faithfully did so. They were substantially aided also by their national inclination towards cleanliness. Now it is plain that our problem is a different and a much more difficult one than that of the Japanese authorities. Let us assume for the moment that we shall have men in command who realise the importance of these things and know what should be done. They cannot appeal to superstition, nor is the desirable practice merely required as an amplification of the men's existing customs. They have no choice but to appeal to the men's intellects. We are told that one of the disastrous facts in South Africa was that the men simply refused to believe in the wisdom of the most elementary sanitary precautions. They did not care what they drank, nor where they bathed ; they could

not be persuaded to keep milk and other food covered, if it was any trouble to do so, though typhoid was raging and flies ubiquitous, carrying the infection to every accessible kind of food—including, of course, the most valuable of all foods, which is milk. Thus the few doctors, who alone were possessed of the life-saving knowledge amongst all that host, had to fight against both the confident arrogance of the officers, and the careless scepticism of the men. Hence the ghastly roll of preventable deaths in that most hideous of campaigns.

There is nothing for it, plainly, but the staggering suggestion that we set to and make ourselves an educated people. Knowledge was always power, but it is vastly more powerful nowadays as it is vastly extended knowledge: and where sufficient numbers go with sufficient knowledge, there victory will be. As for numbers, we in Great Britain are hopelessly, markedly, and inevitably outstripped by Germany. It is part of natural necessity and must be so. For our national survival we need knowledge above all things: it has been the making of modern Germany, and has not yet ended its career of conquest for her. We must have the elements of the laws of life and death taught in our schools; I see nothing else for it, even if the *demos* of to-morrow is to be a trifle uncertain about the sequence of Henry VIII's wives, or the rights and wrongs of the Hundred Years' War—whatever that was. In the coming time we simply cannot afford to have an educated class, so called, providing the officers for our Services, to whom chemistry is "stinks," and bacteriology "bugs," and Lord Lister a "sawbones." The hour comes when it is a matter of life and death whether these men know what Listerism means, and then they fail

us ; and of what use are their good looks, and their easy manners, and their courage ? But we go merrily on, supposing that we are the "boys of the bull-dog breed," that one Englishman is worth three Frenchmen, and so forth, whereas the question at issue may be, which side uses the best filters ? It would be absurd to decry courage and breeding and tradition ; but would it be more absurd than to decry or ignore science, as our courage and breeding and tradition still do to-day ?

It is in matters of medical science that our popular knowledge is especially behind the times. Such modern inventions as the motor-car have not only served to instruct large numbers of the population in some of the elements of mechanics and chemistry and electricity, but they have sufficed to teach the people at large that these sciences really exist, and that their students must certainly be consulted and obeyed when occasion arises. But the medical sciences, which are even more important in modern war than mathematics or electricity or mechanics, have enjoyed no such advantage ; and the tragic circumstance is that they are almost wholly in the keeping of a great and highly organised profession, jealous, conservative, standing upon the ancient ways, dominated by the interest of the majority within itself, as all professions tend to be. The doctor sets out to be and undertakes and tries to be anything but a doctor, which is to say, a teacher. The rather does he cultivate a professional manner and a professional jargon, designed to soothe and impress rather than instruct the public ; and an ancient language, illegibly written, in which to write his prescriptions. The doctor who would become a real doctor, otherwise than as a teacher of medical students, is looked upon

with suspicion or contempt, it is hinted that he is little better than a charlatan, and if he has any design of practising his profession he will find that he is either gagged or discredited or boycotted. In order to speak freely he must cease to practise, as the present writer did many years ago, and even then let him beware of attaining or appearing to attain any measure of success, if he would escape censure.

None of this is as it should be, and it is doomed, lock, stock and barrel. There is rising up a new kind of doctor, who is indeed a doctor. He is not allowed to undertake general practice, and so is practically exempt from the paralysing pettinesses and anti-social vagaries of professional etiquette or medical ethics, fantastically so called. He is the Medical Officer of Health, prefiguring the future, when practically the whole of the efforts of the medical profession, so far as gross disease is concerned, will be devoted to its prevention; and when the general practitioner will be chiefly a consulting psychologist, as was suggested by myself nearly a decade ago, and as we are actually beginning to see already in the United States of America. Meanwhile the general practitioner of to-day finds himself yearly in harder straits, and there is indeed no hope for him except by such a mutation or change of type as I have suggested.

And slowly but certainly the profession and the public alike will grow accustomed to what is still a startling novelty and something, it appears, of an anomaly—the doctor who is really a doctor. The public is only partly to blame—though it *is* partly to blame—for its present appalling lack of knowledge in the elements of hygiene and medicine. The pro-

fession, as has been hinted, is also to blame ; and the time is at hand when the General Medical Council, in especial, will have to consider what attitude it should adopt towards the man who desires to spend part of his time in teaching the public by his voice or his pen, or both, yet who does not desire to be completely cut off from any practice of his own. At present, judging by the only case known to me, and as far as I know the first case of the kind, which happens to be my own, the would-be doctor must abandon all practice, or his professional "brethren" will accuse him of advertising and he will get into trouble. Now it may be economically risky to cease practice, and it may be a disadvantage to the teacher, as when a doctor, after a lecture of mine on alcohol, sought to discredit my condemnation of that compound on the ground that it was some time since I had been in practice.

All this may appear to the reader to be a digression, and a quite irrelevant one. But it is not so. The whole purpose of my book is didactic and none other. It is written to instruct the public, a function for which I make bold to claim high honour and the utmost utility. This instruction is hitherto ludicrously inadequate in quantity and in quality—a remark which gives an obvious opening to the critic—but it cannot long remain so if we are to maintain our national place in the world. From the problems of modern wars, and certain recent illustrations—astounding, as I think—with which it furnishes us, I have sought to prove that public opinion must be educated and instructed in these matters until it reaches the status of public knowledge. That end can be satisfactorily attained only through the co-operation of those who alone are at present

possessed of the knowledge in question, namely, the doctors: and that is my reason for discussing the means whereby doctors may be made doctors, and the difficulties which at present lie in the way. The people perish, or will perish, for lack of knowledge: which end may this book, in however small a degree, serve to avert.

## CHAPTER X

### SURGERY AS IT IS

In the present chapter we may attempt to survey the science and art of surgery as it is to-day, after the revolution. But in the first place, we shall do well to contrast the theatres of the past with those in which the surgeon of to-day chooses to work. The contrast is of practical importance, for it may lead us to conclude that a private house, even if it be a palace, can never be the place of choice for a surgical operation.

The surgery of the past, with its large theatres, in which several hundreds of spectators could watch, or suppose that they were watching, an operation, has gone for ever. If there is any fashion in which the modern surgeon can afford to be spectacular it is with the aid of the cinematograph. By this means M. Doyen, the well-known surgeon of Paris, whose skill in operating is certainly no less exceptional than his skill in drawing attention to it, was able to demonstrate the rapidity and technique of some of his operations before a critical audience in Edinburgh some years ago, and I believe that the method has since been adapted to more useful purposes. But, apart from such means, the surgeon of to-day is best content when he has no spectators at all, and certainly he has nothing to say to the possibility of having his patient wheeled into a room occupied by

crowded students from the dissecting-rooms and the *post-mortem* theatre. Thus the large theatre which was used for some of the earliest abdominal operations in the Royal Infirmary of Edinburgh in Lord Lister's day is now used for the holding of out-patient cliniques, and its place is taken by a dozen or more new theatres which, between them, have scarcely more area.

The surgical theatre of to-day, like the modern lying-in room, ought to be built for its own purpose and used for no other. It cannot be used for operations one day and for out-patients the next. "No admission except on business" must be its motto. This is holy ground, to be trodden only for purposes of worship and never by the soiled foot. It is perfectly certain that, though the surfaces of inanimate objects are, more often than not, covered only with innocent microbes, our own persons and clothes always carry microbes which, whilst innocuous to ourselves or to others under ordinary conditions, are capable of causing disaster *in a wound*. Thus everyone who enters a surgical theatre is a source of possible danger to present or future patients unless he takes special precautions, and the modern surgeon insists, most rightly, on those precautions being taken. The casual boot must no more enter the temple of this sane and scientific cult than the mosque of the Mohammedans. Wellington boots, capable of free external disinfection, and never permitted to leave the theatre, must be donned by the surgeon or the visitor: not that we can demonstrate such precautions to be necessary, but because it is evidently our duty to take them until they have been demonstrated to be unnecessary. This comparatively trivial point may be placed in the forefront of our statement

because of its suggestive parallel to the religious practices of the past. A surgical theatre is a sacred place, dedicated to the cause of Life, clean in no ordinary sense, and not to be profaned. The visitor should enter it with a hushed sense of responsibility and of privilege, if not of actual worship, or he is impenetrable to the spirit of the place.

Let us consider another point, which is of much greater importance. In the beginning, as we may recall, Lister employed a carbolic spray, designed to kill the microbes in the air surrounding the operation wound. That spray was an annoyance to the surgeon, its contents were injurious to the tissues of the patient, and better results have been obtained without it. But this is not to say that Lister's aim is not recognised nor sought to be realised, by far more efficient and *aseptic* means, in our own day. For in the first place, all the air which enters a modern theatre of the best type is first filtered by passage through suspended fibres down which water is constantly dripping, and this filtered air, after being suitably warmed, is forcibly driven into the theatre by what is called the *plenum* system of ventilation. No casual air is allowed to enter, but only that which has been filtered, warmed and moistened. This arrangement naturally goes some distance towards achieving the end for which Lister designed his carbolic spray, and does so in a far more satisfactory way. The remaining risk, so far as the air is concerned, is now derived solely from the persons who enter the theatre; and in this respect, also, appropriate precautions are taken. Thus it may be carefully arranged that, if seats be built for, say, half a dozen spectators, they shall be so placed that the pure incoming air shall flow first past the patient

and then past them on its way out. They may take their chance—which is really no chance worth naming —of infection from the patient, but they cannot injure him, for no microbes leaving their clothes or breath could "swim up-stream," so to speak, and reach the operating-table. Again, it is rigorously decreed that no one shall come to the theatre from dissecting-room, post-mortem room, infectious fevers wards, or attendance upon any infection; and the spectators enter and leave by a special door, close to their appointed seats, so that the risk of their affecting the patient's chances in any degree at all is wholly excluded.

But the air around the wound might be infected from the clothes or the breath of the surgeon himself or his assistants, and especially is there some risk to be apprehended from the hair and the breath. Therefore those who are really to surround the patient must wear sterilised blouses and aprons and caps, not to mention their boots; they should for preference be clean-shaven; and all-embracing sterilised caps will be used so as completely to cover their hair. In some cases a type of costume is worn which leaves nothing but the eyes exposed, but if not, the surgeon nowadays usually wears some kind of respirator over the mouth, not, as in the usual case, to prevent microbes from entering, but to prevent them from emerging. Possibly microbes never leave the mouth and nose in ordinary breathing, but they certainly do so in coughing, and in the mouth-spray which accompanies, to some extent, even the least explosive speech. Thus, if we are inclined to laugh at the carbolic spray, or label it superfluous, let us remember that, under modern conditions, we recognise the principle of the spray, and achieve its

aim on aseptic lines, by filtration of the air entering the theatre, by eliminating the risk of the spectator, and by covering the clothes, hair and mouths of those who surround the patient, so that the air which is in contact with the wound is practically sterile. Plainly, if aseptic surgery is to be practised, these precautions regarding the air are necessary, or a consumptive surgeon or nurse, to take only one instance of many, might infect the wound by the simple act of speech.

Let it be added that the corners and edges of the theatre are rounded and smooth, and that the floor is always moist, no such abomination as the dry cleaning practised in most houses being thinkable for a moment, that walls, floor and everything else are regularly swilled with antiseptic lotions, and that the most strenuous precautions are taken whenever any septic case has had to be dealt with. If the surgeon has several cases to deal with in one theatre on one occasion he will, of course, take first the cases of "unbroken skin," and last those which actually bring infection into the theatre. Or a given theatre may be entirely given up to non-septic cases, so that no gross infection ever enters it at all.

But there is much more to be said before we have done justice to the modern surgical theatre. The lighting arrangements must be perfect, alike for natural and for artificial light. One does not need to be a surgeon to know that it is necessary for him to see, in his theatre, by day or by night, as well as he possibly can; and some kind of portable light is a necessity for special purposes. Then, of course, there is all the apparatus for the sterilisation of blouses, caps, aprons, swabs, instruments and so forth; and the provision for the sterilisation of the

surgeon's fingers, the water being turned on and off by pedals, so as to avoid the risk involved in the turning of taps. Glass tables on rubber castors, and the like, will be a convenience, and the operating-table must be of the right height, perfectly washable, warmed throughout, and susceptible of bending in various sections or of angular movement as a whole.

No one would be so foolish as to assert that failure will follow the absence of these precautions and this provision in every case. Successful and cleanly operations have been, are being, and will be performed, though in steadily diminishing numbers, in private houses, in conditions which defy every Listerian canon, on the battle-field, in the dry dock or the coal-mine, or amid the wreckage of a train. Emergency cases will always occur, oftenest in ordinary houses, but also in many other places, where the surgeon must operate on the spot as best he may, and in a very large proportion of these cases he will be successful, notwithstanding the conditions, in performing an adequate antiseptic operation. But the conditions which have been described in the foregoing pages, and which are illustrated in, for instance, the beautiful twin theatres at St. Thomas's Hospital in London, which were opened by Lord Lister about a decade ago—are those which conduce to the highest measure of success ; and no one can contemplate them without realising that, in this one respect alone, the public provision for the practice of Listerism is lamentably inadequate, but not more so than the public appreciation of it.

Let it be clearly understood, then, that a bedroom, or any other room in a private house, is no place for a surgical operation—though perhaps the best of modern bathrooms are not very far from the ideal.

This is no less true than that the ordinary bedroom is not the ideal place, from a Listerian point of view, for a confinement. If, therefore, the surgeon considers an operation advisable, and it is possible to move the patient so as to have it performed in a theatre built and kept for the purpose, my counsel to the public is that his advice and wishes should be respected. The advantage to the patient is well worth the extra expense; and one of the leading purposes of the present volume will have been frustrated if I have not succeeded in convincing the reader that that is so.

Here, of course, the demands of science come into conflict with modern economic conditions. At present, the navvy who is carried to hospital with a compound fracture can immediately avail himself of a surgical theatre such as we have described, and in London and in a very few other large cities there exist surgical homes which are similarly equipped, and of which the substantially well-to-do can avail themselves. But there are not enough surgical theatres of this type in the world for a tenth or a hundredth part of the cases which really should be treated in them, and there is a vast and most important section of the community which has not the advantages in this respect which are shared by the wealthy and the poor.

No plea is here made that we should start any philanthropic enterprise for the provision of modern surgical theatres everywhere. All the available money and time and labour, and much more, are still and will long be required for the much more profitable task of removing the conditions which lead up to the need for surgical intervention at all. Better than building theatres is the abolition of the need for them. But

the present state of things is highly anomalous, and for the nonce one may leave it simply stated here, hoping to have insisted, first, that where there is a choice between operation under ideal conditions or operation at home, we should be prepared to make a monetary sacrifice which is certainly worth while; and second, that there is room and occasion for some kind of common provision amongst the class still unprovided for in this respect, possibly by means of insurance against the need of an operation, which seems to me to be a very sensible precaution, and also by other economic devices which were better left to the suggestion of those more competent in such matters than the present writer.

We may now proceed to survey the accomplishment of surgery to-day, and may choose a representative case, illustrating the kind of use to which such theatres as have been described may be put. When the conditions for asepsis have been established, both in the equipment and ventilation of the theatre, and in the technique of cleansing the patient's skin and the surgeon's fingers, he is entitled to operate upon unbroken skin in cases where neither life nor health is involved, where there is no pain nor injury nor defect of any kind threatening to shorten life, and where, for sufficient reasons, the surgeon may actually make four compound fractures at one operation. These cases are all the more significant of what Listerism has achieved if we remember that its first achievement was to lower the death-rate after amputation for compound fracture. One can scarcely believe that even Lord Lister himself, when he was performing those amputations and saving lives which would otherwise have been lost, could have guessed that in less than thirty years his disciples would be

deliberately laying a child upon a table and breaking each leg in two places by means of knife and chisel and saw. We have to realise the formidable character of inflammation occurring in bone, its very great risk to the limb, and the substantial risk to life, more especially in young patients, in order to realise the pitch to which aseptic surgery has attained when four compound fractures may be produced in a single patient who suffers from nothing more deadly than knock-knees.

Of course there should be no such things as knock-knees, for they are the consequences of rickets, which is an entirely preventable disease of malnutrition, and even on the rankest grounds of economy it would be cheaper to prevent it than to pay for its treatment in general hospitals, though the former would be called "socialism," which Lord Rosebery assures us is "the end of religion," and the latter is charity and therefore religious. But whilst thinking of this highly aristocratic order is allowed to control our national policy, there will be plenty of rickets to treat, and plenty of consequent knock-knees. These are, of course, a deformity, and they very considerably subtract from the stature. But the surgeon intervenes, guarded by his perfect technique which he practises in a theatre such as we have described and, having cut down to the two thigh-bones or femora, and shin-bones or tibiæ, he breaks all four, and sets them so as to produce straight limbs. The patient goes back to bed with his compound fractures of both femora and tibiæ, makes an uninterrupted recovery, with no pain worth mentioning, nor fever, nor even malaise, and leaves his bed straight-limbed and some inches taller than when he took to it: also as enthusiastic as ever about

Mr. Chamberlain or President Roosevelt, and as ignorant of the name or the existence of Lord Lister.

This case is in some ways perhaps as striking as any that can be named, though the popular notion of the distinction between " vital " and other organs will fail to appreciate its full meaning. It is a type of that great variety of cases in which surgery finds the best conditions for its success. No microbes are present, the operation can be performed so as to ensure that none are introduced, and the problem becomes, for practical purposes, a purely mechanical one. Under these conditions there are practically no limits to what the surgeon may achieve, and he makes further advances every year. But I know of no other case where such formidable injuries are produced without being demanded in the interests of life or health.

Perhaps more striking, to those who do not know what a compound fracture under ordinary conditions means, is the justifiable freedom with which the surgeon now opens the abdomen for purposes of diagnosis rather than anything else. A " diagnostic incision " in order to " explore the abdomen," in cases where the surgeon does not expect to do any more, is a matter of everyday practice ; and since most of us know what peritonitis means, this may serve to indicate the range and the security of modern surgery, as also the remarkable degree to which the body will withstand injuries, provided that it gets a fair chance, and is not asked to withstand infection also.

The peritoneum is the lining membrane of the abdominal cavity, and is reflected upon the abdominal organs so as to constitute an external coat for them. The introduction of pathogenic or disease-producing

microbes into the abdominal cavity leads to peritonitis, which is an exceedingly deadly form of inflammation, being even more so in men than in women. This introduction may occur from without or from within. A surgical, a homicidal or an accidental wound may introduce the microbes from without, and the great service of Listerism to abdominal surgery consists in its assurance that the Listerian surgeon may confidently open the abdomen without fear that he will set up peritonitis.

But much the greater part of abdominal surgery is concerned with the risk of peritonitis being set up *from within*. The surgeon now intervenes, arrests or removes the condition which is threatening to produce peritonitis and, producing no peritonitis on his own account, is able to save the patient's life.

The nature of these cases will be clear if we consider the rudiments of abdominal anatomy. Through the abdomen there runs a much-coiled tube, of which the stomach is the most capacious portion. Anything inside this tube is, in a sense, outside the body, and it is constantly occupied, in point of fact, by certain microbes which could not be tolerated anywhere else. If they pierce the wall of the tube and reach the peritoneum, they set up peritonitis, with disastrous results, just as if the surgeon or an assailant had introduced microbes to the peritoneum from without. This accident, commonly known as perforation, is one of the risks of typhoid fever, and it not infrequently follows from the existence of ulceration in the stomach. In the latter case the surgeon might intervene before the ulcer gave way, and might excise it altogether, bringing the edges together, and so cure the patient at a stroke. But the commonest

cause of peritonitis in men is perforation following upon inflammation in the appendix, and when the surgeon operates for appendicitis he does so in order to prevent an imminent and very probably fatal peritonitis, which would otherwise follow. He finds the appendix, and bodily removes it, brings together the cut edges of the bowel, and so saves the peritoneum and the patient.

People often ask why we hear so much of appendicitis nowadays, and how it is that our ancestors did not suffer from it. But there is no doubt that they did suffer from it, and evidence of its occurrence has been found in an Egyptian mummy. But before surgery dared to intervene, appendicitis very commonly developed into peritonitis, usually fatal: and it may roughly be said that we nowadays hear about appendicitis just in proportion as our ancestors used to hear about peritonitis. Nowadays the surgeon intervenes, prevents infection of the peritoneum, and in many thousands of cases every year saves the patient's life. In Great Britain there are now about fifteen thousand operations for appendicitis performed yearly, and it is not an unreasonable estimate that in two-thirds of these the result is to save life.

The procedure of operation for appendicitis has been grossly abused in some hands. So have the tenets of Christianity, to take no other instance. To condemn surgeons and surgery in the one case would be no more justifiable than to condemn religion in the other. To this subject we shall return. Meanwhile let us note that there are two distinct conditions in which the surgeon may propose to operate for appendicitis. He may do so because it is evident that otherwise the patient, evidently suffering from acute

poisoning, will die. But he may also do so when the patient is perfectly well, and in no immediate danger of any kind. The propriety of this procedure is one which necessarily comes up before the layman very frequently, and it may carefully be considered here, none the less because it has been so often abused.

Appendicitis is a disease of somewhat obscure origin, but is beyond all question the result of an infection. The microbes which do the harm may be of recent and exceptional introduction into the body, as most of us would take for granted, or they may be a vicious development of microbes which normally inhabit the bowel without harm ; and, if so, we have yet to learn the cause of the change in their behaviour. However that may be, the malady is an infection and, after recovery from it, the patient is presumably in some way altered in consequence of the chemical processes which were involved in the disease. In a large number of infections, as we know, the subsequent change in the patient is such that he can scarcely be infected in that fashion again. He has acquired an immunity which may be lifelong or last for some years, but which is very real and very satisfactory.

But in a large number of other infections no such result obtains, as in the case of small-pox or scarlet fever. In the various infections of the respiratory tract, such as pneumonia, pulmonary consumption and influenza, all the evidence suggests that each attack renders the patient not less liable but more liable to another. Why these profound differences between apparently parallel processes should exist we cannot say, but the fact is unquestionable. Unfortunately the surgical infections in general appear to confer no immunity and, so far as appendicitis is concerned, it is exceedingly probable

that the patient who has recovered from one attack will have another. Further, the attacks are liable to become more severe; and the operative procedure which may be required sooner or later will become progressively more difficult as the number of previous attacks increases, for they involve local injury, displacement and complications which present to the surgeon a problem which may be insoluble and is certainly very different from that involved in removing a practically normal appendix.

On these grounds it will surely be clear that, if a patient's general constitution be satisfactory, and if the surgeon can be assured of the safety of his aseptic precautions, it may be well worth the patient's while to be rid of the appendix once and for all, even though it is always possible that the appendix may never be going to give any trouble again. Much more urgent are the indications for this procedure in cases where a young man is about to go abroad pioneering, or where a young woman is about to be married.

The surgeon lives mainly on the fees he obtains for operating, and thus, if for no other reason, he has a bias in favour of recommending an operation whenever he can. Thus this particular operation may be, and often has been, performed when there was no adequate reason for it. It has been performed, also, by incompetent or unlucky men who have not succeeded in finding the appendix at all, but have held their tongues, and the subsequent occurrence of appendicitis in the patient who naturally supposed that he did not possess an appendix has been highly discreditable to surgery. The plain lesson to be drawn is that, as in all other circumstances, exigencies and needs, one should have to do with

responsible, competent and honourable people. This necessity is not peculiar to surgery; it is just the same if one desires to get married or make a will or a friend.

When the conditions are satisfied it may very well be that an operation is recommended. The appendix is removed, without any risk worth naming, and the risk its presence involved is removed for ever.

Nor is this by any means the only case in which the surgeon nowadays opens the abdomen without anything like absolute compulsion. The procedure is so safe and simple that it may be undertaken for any purpose which requires it. Thus, for instance, it may happen that a kidney, which should rightly be fixed in its position by means of a firm envelope of fat, becomes movable or, as the inaccurate expression goes, "floating." No risk to life is involved in this condition, but it appears sometimes to be a cause of nervous symptoms of various kinds, and of some pain. Here the surgeon is quite at liberty to open the abdomen and stitch the errant kidney to the fibrous membrane covering the last rib, so that it can wander no more. The risk of such a procedure in anything like competent hands is probably much less than that of, say, engaging a taxi-cab for a journey across London.

The degree of merely mechanical injury which the body will tolerate is quite amazing. The introduction or manufacture of poisons in it is a very different matter, but that is precisely what modern surgery avoids. If certain other conditions, by no means impossible, are complied with, the surgeon may practically do anything he likes. The especial risk of extensive abdominal procedures lies in what is called "surgical shock," but that is a condition

which becomes rarer and rarer as surgeons improve the details of their technique. If the patient is kept properly warm throughout the operation, if he is kept unconscious by means of a minimal but constant quantity of a pure anæsthetic, for the inhalation of which he has been carefully prepared in the matter of diet and so forth, and if the operation be conducted on aseptic lines, so that his body is not compelled to absorb considerable quantities of powerful poisons like carbolic acid and perchloride of mercury—"surgical shock" will be very rarely indeed observed when he gets back to bed. Under these conditions the abdomen will tolerate, for instance, the removal of eleven feet or more of the bowel, the removal of the entire stomach, and a host of other operations of which these give a fair indication. In what is called Cæsarean section the obstetric surgeon demonstrates the highest possibilities of abdominal surgery, and nothing more triumphant could well be imagined.

Abdominal surgery is now a commonplace, and it does not strike us as remarkable. It is true that the abdomen does not contain vital organs in the same sense as the chest and head, and it is true also that the surgery of these parts of the body is of later development, and thus has attracted more attention of late years. But however great the skill which the surgeon develops in dealing with the needs of the chest and head, he can never find in these any such field as the abdomen offers him, and we cannot doubt that, apart from the sphere of obstetrics, the chief services of Listerism to mankind are summed up in the phrase, abdominal surgery.

Conspicuous illustrations are furnished by those not infrequent maladies which, whilst long compatible with life, are without doubt the most painful to which

we are ever exposed. If any mechanical obstacle sticks in one of those tubes of the body which are lined with unstriped muscular fibres, the consequent efforts of those fibres to dislodge the obstacle tend to assume an acutely spasmodic form, giving rise to attacks of what is called colic. Such mechanical obstacles not infrequently occur in relation to the secretion of the liver and that of the kidney, giving rise to what is called hepatic colic in the first case and renal colic in the second. Other symptoms besides the pain occur in such cases, and these may sometimes be of grave import, but the appalling and unparalleled pain is the leading feature of such cases. The obstacle in question is a solid mineral body, formed in one fashion or another by precipitation of certain mineral salts which should normally remain in solution and thus pass along the ducts without difficulty. In these cases of gall-stone or stone in the kidney the resources of medicinal treatment are very commonly inadequate. Powerful sedative drugs may somewhat dull the pain, at serious cost to the patient's nervous system ; and a variety of drugs and diluent fluids may be taken in the hope that the obstructing stone may be redissolved and thus dissipated. But the patient's plight too often remains pitiable.

Here Listerism mercifully and triumphantly intervenes. During the last decade it has been substantially aided, so far as diagnosis is concerned, by the use of the Röntgen rays, which will frequently serve to demonstrate and locate the offending stone. This innovation may be of value in directing the surgeon's knife, and also in forbidding its employment by demonstrating that no stone is present in a suspected case. Usually, however, there is no doubt. The surgeon, fortified by his Listerian technique, cuts

freely and safely down upon the obstructed duct, whichever it may be, opens it where the presence of the stone is palpable to his finger, removes the stone, stitches up the duct, makes good the injury done in reaching it and, if he follows the principles of my humane and inspiring teacher, Professor John Chiene, will show the stone or stones to the patient on the following day. There is scarcely a simpler, more satisfactory or more dramatic cure to be obtained in the whole realm of the healing art.

More recent than these applications of Listerism to the abdomen proper is the advance of surgery in the lowest section of the body cavity, which is known as the pelvis or basin. Progress here is rapid and recent. When I was a student, only a decade ago, I remember another student suggesting to Professor Chiene that a gland called the prostate might possibly be removed in order to relieve the injury caused by its not infrequent enlargement. The reply was that such an operation would be beyond the limits of surgical possibility. But it is now performed almost every day, and total excision of the prostate has been the boon of boons to many hundreds of elderly men during the last few years, for whom nothing could have been done in any past time.

The professing Eugenist cannot but make special reference to other possibilities of surgery in this region of the body. There are not a few cases where the principles of what I have called negative eugenics, and have defined as the discouragement of unworthy parenthood, seem clearly to demand the aid of surgery for their due realisation without the infliction upon the individual of more hardship than the present state of public opinion would be willing to countenance. The demand in such cases is for

what is commonly called sterilisation, the word being used in a sense very different to that which it bears on many pages of the present volume. Let it be clearly understood that sterilisation is not the indicated measure for the majority, or even for so many as one-tenth, of those who should come under the ban of negative eugenics. In the great majority of such cases, including the whole company of the feeble-minded, we find that the individual, if permitted to remain in the community, injures it and is injured by it, quite apart from any eugenic question. Such persons require what for many years of public propaganda I have been accustomed to call by the somewhat ominous name of segregation, but what I now call "permanent protection," which means precisely the same thing, but states it in a fashion which does not lead the foolish critic to suppose that we are recommending something punitive or cruel. Now if the feeble-minded or other persons who come under the ban of negative eugenics be permanently cared for apart from the rest of the community—and, of course, under conditions which involve the separation of the sexes—they do not require to be sterilised.

But when that is clearly recognised it remains true that, in not a few cases, ever occurring, sterilisation, and nothing else, is the ideal remedy or prophylactic for the future. The public genius for getting hold of new ideas by the wrong end has showed itself in this instance also, and sterilisation has been pictured as a cruel and brutal measure, proposed by cold-blooded men of science in the spirit of the Inquisition as a species of new-fangled torture to be inflicted upon practically every unhappy person who does not come up to their eugenic standard. On the contrary, I

propose sterilisation for certain cases as the most humane measure which can be applied. There are not a few instances where, in coming days, the law might well offer to the individual the alternative between some form of seclusion and sterilisation. Now, whilst permanent care is the only kind and economical way of dealing with the feeble-minded, it would be, of course, a very cruel and a very expensive way of dealing with a man who was perfectly able to look after himself and do useful work, but the possibility of parenthood on the part of whom was to be rigorously excluded. In some such cases as these it would be immediately seen that sterilisation was the humane way of meeting the social need. So far as the future is concerned, it simply puts an end to the individual; so far as the present is concerned, it effects no change whatever; and that is precisely what is to be desired in the cases under consideration.

By sterilisation I mean no operation which involves the removal of any portion of the individual. In the ordinary course of gynecological surgery the ovaries are very frequently removed, either for disease or for the threat of it. This operation of "double oöphorectomy," as it is called, is simple and expeditious; and though it was at one time performed far too freely, it is a justifiable and necessary procedure in many cases. The chief objection to it, apart from the permanent sterility which necessarily follows it, is that, as we now know, the ovaries produce not only the germ-cells from which future generations spring, but also what is called an "internal secretion," a fluid of still unknown composition which is contributed to the blood as it passes through the ovaries, and has most important influences upon

not only the body, but also the temperament and womanliness of the woman. The more we learn of the so-called "ductless glands," the more do we respect the principle of internal secretion; and the surgeon to-day, who has learnt the astonishing consequences which follow removal of the thyroid gland, must be well assured before he consents to remove any gland that contributes an internal secretion to the blood.

The importance of the racial glands, not only as containing the germ-plasm, but also as chemical laboratories, performing some notable though obscure services for the individual, is now generally recognised to be true for both sexes, and the first point on which it is necessary to insist is that the operation proposed for the sterilisation of certain individuals who come under the ban of negative eugenics, but who should not be segregated, is in no case a removal of the racial glands. After the operation, as before it, the internal secretion of these organs is contributed by them to the blood which circulates through them, nor is there any reason why it should be otherwise, seeing that neither the glands nor the blood or nerve supply to them are even touched by the surgeon in the course of his procedure.

But in both sexes alike there are minute tubes, easily accessible, which have the duty of conveying the germ-cells from these glands, where they have been formed by that wonderful process of gameto-genesis on which the attention of so many biologists is now concentrated. If now a thread be tightly tied round any of these tubes, or, better still, if two such threads be tied, and the duct divided, or even half an inch of it removed, between them, no germ-cell will thereafter be able to traverse it. A single

thread might slip, or be too rapidly absorbed, or not tightly enough tied ; but the use of two, with division of the duct between them, involves only a few seconds' more manipulation, and is to be relied upon thereafter. If this be done upon both sides of the body, so far as the future is concerned, the individual is as if he or she were dead.

So far as the present is concerned, nothing at all has happened. The intact racial glands perform their chemical processes as before, and their internal secretion maintains the characteristics of the individual. Nothing more has happened than the interposition of a mechanical obstruction to that translocation of the germ-cells which is necessary for conception. All the characteristics, functions, appetites, and capacities of the individual are retained intact : but those which are concerned with the "racial instinct," as I prefer to call it, will fail of one thing only, and that is conception.

The service of Listerism to the Eugenist in this connexion is clear. It offers him what without it he could not have—a measure which is perfectly adapted to his need, and which can be commended to public opinion sincerely, without reserve, and in the not unjustifiable hope that in due course it will be accepted. For many years I never alluded to this subject in public, either by voice or pen, except before medical audiences. It is a most notable sign of the times that now, after only a brief period during which we have uttered the word in public, it may be and is freely mentioned wherever eugenics is studied, has been discussed by the present writer and others in many responsible gatherings of clergymen and of women, and has had attention drawn to it in *The Times* by such a conservative thinker as Professor

C. S. Loch. We owe it to Listerism that, in commending sterilisation as the eugenic demand for certain cases, we can assure the public that these operations of vasectomy or salpingectomy, which do not even involve opening the abdomen in either case, are perfectly safe, simple and certain ; and that no evil consequences of any kind follow from them.

At one time I feared that the public would never tolerate the idea of surgical sterilisation, if for no other reason than for the simple one that it seemed impossible to get anyone to understand that sterilisation does not involve any form or degree of mutilation, or of injury to the feelings and potencies of the individual. It was therefore with much hope that one turned to the evidence which suggested that the Röntgen rays, accidentally found to cause sterility in certain cases, might be intentionally employed for this purpose. At the time of writing, however, it is by no means clear that these rays are safely applicable for the purpose, even though the physicists, as Sir Joseph Thomson has lately pointed out, can provide us with the means whereby the "soft" or non-penetrating, and "hard" or penetrating rays can be separated. Even if we are provided with an apparatus which produces only hard rays, so that injury to the skin is not to be expected, and even though the evidence from the lower animals suggests that these rays may cause sterility in very few applications, we still have to reckon with the objections that the consequences of the application cannot be observed, that the impaired fertility might be restored, just as the growth of hair apparently destroyed by the rays is often restored, and that the rays which affect the germinal function of the glands may also affect the processes whereby they produce

their invaluable and irreplaceable internal secretion. None of these objections have any counterpart in the procedure of operative sterilisation, which, indeed, has to contend only with the general prejudice against the knife and misunderstanding of what it is called upon to do in this particular case.

Here, as in every other instance known or imaginable, power is non-moral in itself, and may be used for good or for evil. The operation of vasectomy may easily be turned to non-moral or to grossly immoral ends, by being performed for the convenience of the individual. That is a question which must inevitably be faced some day, quite apart from the demands of eugenics. Men will discover that this procedure is practicable and safe, and that in less than ten minutes they can be deprived, for ever, of the possibility of fatherhood and of nothing else; and they will in some cases approach the surgeon for this purpose. The demand of the eugenist, that this operation should be performed in certain cases, remains to be considered on its merits, and cannot possibly be prejudiced, in the minds of rational persons, by the circumstance that the operation in question—which was not invented by eugenists—may be employed for illicit ends. And I, at any rate, am one of those who believe that all forms of knowledge and power are to be accepted since, in the long run, they will be turned to the service of wisdom and her children.

In the domain of the pelvic surgery which we owe to Lord Lister must be included practically the whole of modern gynecology. Here, also, is a field which, like that of appendicitis, is fruitful, and has been still more fruitful, of abuse. The abuses will disappear and the good will remain. On the other hand, the

occasions for resort to the gynecological surgeon will gradually diminish in accordance as we learn how to prevent the disorders for which his intervention is now required. As we have already seen, the time is at hand when Listerian obstetrics will be available for all mothers, and its coming will vastly diminish the number of women who need operative gynecology. Further, the time is at hand when we shall begin to deal with those eminently preventable infections from which our shameful shame and still more shameful carelessness still permit them to suffer; and when we have controlled them the field of gynecological surgery will be very greatly diminished.

Nevertheless, it is certain that for some time to come women will continue to suffer, as heretofore, from tumours, malignant or benign, of the pelvic organs, for which nothing but surgical intervention can afford them any relief. It is such a commonplace nowadays to accept the services of Listerism in this connexion, and so impossible to come across a case which has been allowed to go beyond a certain point, that old pictures of patients suffering from untreated ovarian tumours strike one as simply incredible: how could people have existed under such conditions? We cannot as yet explain the origin and causation of either simple or malignant tumours: but both are exceedingly common in the pelvic organs of women, and the services to them of Listerian surgery in this connexion alone can scarcely be over-estimated; nor are they for one moment to be decried because gynecologists in the past have been willing to remove the ovaries without due occasion.

It is an especial purpose of this chapter to demonstrate the liberty which Listerism affords the surgeon to deal with all manner of conditions which do not

threaten life, or even health. Surgery is now so far from being a desperate remedy for desperate diseases that it may freely be invoked for merely æsthetic purposes, as we shall later see. It may accomplish what would at first hearing seem to be utter impossibilities, as in the recently recorded case of a man who accidentally chopped off a finger, which he casually deposited in his pocket, where it lay in tobacco dust and similar rubbish, whilst he walked four miles to a doctor who, after cleansing it, was able to restore it in such a fashion that it has done its customary duty since. In the whole realm of so-called orthopædic surgery we find possibilities which are almost daily being further exploited by the surgeons. The case has been already quoted of the deliberate making of four compound fractures for nothing more serious than knock-knees. But this is only one instance of many. Deformities, injuries and paralyses of the lower limbs are very common, and since they will tolerate any kind of surgical interference, provided it be Listerian, they are now constantly dealt with quite apart from any compelling necessity. The surgical treatment of flat-foot is not very satisfactory, but much may be done for various forms of club-foot. Some of the small bones of the deformed feet may be removed or modified in shape without fear of subsequent inflammation, and very often great advantage accrues to the victim of the deformity.

Recently much more astonishing things have been done in the way of surgical interference with bones and muscles and nerves. Bony tissue can be transplanted successfully. The tendons of muscles which are incurably paralysed can be attached to normal muscles, which are thus enabled to exercise a pull upon the spot which the paralysed muscle used

to control. Similar operations can be performed with nerves for the palliation of paralysis, and it is astonishing to observe the degree of manipulation to which they will submit. Orthopædics is now one of the most prosperous and useful branches of surgery, and since we are as yet entirely without any key to the control of congenital deformities such as club-foot, or the prevention or cure of the infection which produces infantile paralysis, and since we shall always have accidents with us, it is evident that this branch of surgery has an assured future, and will doubtless be doing good work every day when the surgery of, say, cancer or syphilis will have ceased to exist.

The surgery of the thorax is of much more recent development than that of the abdomen or pelvis, and we do not need to go far to see why thoracic surgery must mostly deal with matters of imperative necessity. The action of the lungs depends entirely upon the existence of the atmospheric pressure upon only *one* side of them. We breathe by enlarging the capacity of the thorax so that air is bound to rush into the lungs through the windpipe. If there be a hole in the chest the air will rush in there, and the lung will immediately collapse and remain inexpansible. If air be admitted through the chest wall to the outside of both lungs in such a fashion, neither of them will expand, and the patient will die at once. Here is evidently a fact which limits the activity of the surgeon, for even if he confines his efforts to one lung, he can scarcely do so without throwing it out of action ; and to attempt to remove a focus of, say, tuberculosis in the apex of a lung, would simply be to deprive the patient of half his vital capacity at a stroke. This is not to say that the

surgery of the lung has not made great advances in recent years, but there are evidently somewhat sharp limits set by natural necessity to its powers.

Between the lungs there lies an organ still more vital, which is the heart, and it was long before surgeons dared make any attempt to deal with this organ. But lately so much progress has been made that only the description of a recent suggestion, endorsed not by sensational or incompetent men, but seriously considered by some of the leaders of the profession, will suffice to indicate its measure.

In consequence usually of the inflammation produced in the course of rheumatic fever, the valves especially of the left side of the heart may become swollen, or rigid or adherent in various ways, which no medicines can remove, and for which time does nothing. Sometimes a valve becomes incompetent, allowing the blood to regurgitate through it, sometimes constricted, interfering with its onward passage. These are typical forms of true heart disease, and they will continue to afflict no small proportion of mankind until we can completely control rheumatic fever and prevent the occurrence of the valvular inflammation which leaves these disastrous sequels. Hitherto the resources of medicine have been unable to prevent the deformation of the valves which is so liable to occur in rheumatic fever, for the salicylates which so greatly relieve the pain do little or nothing for the inflammation. And when the deformation has occurred, medicine can do nothing except attempt to maintain, as far as possible, the vigour of the handicapped heart. But it has lately been suggested that, in the common case of what is called mitral stenosis, where a comparatively accessible valve is contracted and obstructs the passage

of the blood from the left auricle to the left ventricle, the surgeon might introduce a long and delicate knife-blade, so as to slit up the obstruction. This has never been done, and I am far from certain that it ever will be done. We are much more likely to obtain control of rheumatic fever first, and so dispose of the need for the surgeon in such cases. But the fact that it has been seriously proposed may be offered to the reader as some criterion of the possibilities which are open to modern surgery.

The surgery of the heart already has much to its credit. Whilst valvular disease is scarcely accessible, and degeneration of the muscular walls of the organ demands something much more subtle than the knife for its correction, wounds of the heart offer an obvious field for the surgeon who is called to the case in time. Especially is this true of wounds of the left ventricle, which constitutes the greater part of the front of the heart, and has very thick walls. Wounds inflicted there may be dealt with, and foreign bodies, such as the broken-off end of a hatpin, may be removed. But there is at least one case on record which is much more remarkable.

Commonly, as we should expect, wounds which penetrate the wall of any of the chambers of the heart are fatal. The blood pours through them into the bag wherein the heart lies, and shortly accumulates to such an extent that the organ no longer finds room in which to work, and comes to a standstill. Probably there is only one case, since time began, in which a penetrating wound of the heart has not proved fatal in this fashion. In the case in question, which was reported some years ago in Berlin, the left ventricle was completely pierced, and when the surgeon, hastily summoned, reached and exposed the heart,

he found a small stream of blood escaping from the ventricle through the wound at every beat. The surgeon made good the damage in time, sewed up the pierced heart, and was rewarded by the complete recovery of the patient.

We may turn now to the surgery of the head, and particularly to intra-cranial surgery. We shall not understand the possibilities here, however, unless we consider what is meant when we speak of the brain as a vital organ.

In the case of the heart, we found that a vital organ may be wounded, even to complete perforation, without causing death. In other words, only a portion of this organ is really vital, in the present sense of the word. If certain nerve cells, constituting the so-called " intrinsic ganglia " of the heart, be damaged by a knife or a bullet, the heart will certainly cease to beat once and for all. The same is true of the brain. In the very lowest and oldest portion of the brain, to which no surgeon has ever penetrated, we find an area which is really " vital," like the intrinsic ganglia of the heart. This portion of the brain, known as the bulb or medulla oblongata, contains certain nervous centres which control the beating of the heart and the action of the lungs—or, rather, of the muscles of inspiration. Damage of these areas is certainly mortal, and we may therefore call the medulla oblongata a vital organ. Indeed, the older physiologists, who discovered the " respiratory centre " in the bulb, damage of which causes final arrest of the breathing, called this centre the *punctum vitale*, or vital point of the body.

Once we leave the bulb, however—or, rather, a few microscopic points in the centre of it—we can no longer look upon the brain as a vital organ. Accident

or disease, we discover, may compress, or starve of their blood, or even dissolve completely away, large portions of it, which may include any portion whatever outside the bulb, and life may be maintained. An accident in a mine has bodily removed practically the whole of the frontal portion of the brain, in a man who subsequently resumed his work, apparently without particular impairment of his—doubtless very moderate—intellectual powers. Bullets have done extraordinary things in the brain without destroying life. So have the *spirochæte* of syphilis, the tubercle bacillus, the cocci of surgical inflammation, and a host of other parasitic organisms. In certain conditions great areas of the brain are absorbed and cavities take their place. In others, the blood supply to various areas, sometimes of great size, is cut off, and they consequently die and are replaced by fibrous tissue, chalky masses or other substances which are certainly not living brain tissue: and the patient manages to survive.

Plainly, then, no portions of the brain are necessary to life except the bulbar centres for the control of the circulation and the respiration. And further, the brain has remarkable powers of resistance to mechanical shock, and is by no means liable to surrender merely because it is touched—even though the touch be that of a bullet which has penetrated the skull.

Of course we are all aware that certain kinds of mechanical injury may very seriously arrest the normal functions of the brain for a considerable period, as in the familiar case of what we call "concussion of the brain." What exactly happens in such cases we do not know, but the injury is of a special kind, which could not be reproduced, for

instance, by the knife even if a surgeon desired to do so. To ordinary irritation the brain is extraordinarily indifferent, and this most paradoxical fact about the organ of sensation is undoubtedly of the utmost value in cranial surgery. The seat of all our sensations is the brain. If someone steps on our corns, certain cells in the brain are disturbed and we consequently feel pain. Every minutest area of the skin is represented in the brain, as is proved by our response to stimulations of pressure, heat, and cold. The ordinary pressure-sense of touch is known to be represented in certain areas on the external aspect of the brain : whenever we feel a touch we feel it there. But if this very area of the brain, in which all touches are felt, be itself touched it feels nothing. It is a genuine paradox, and a most significant one. Amongst its numerous and important consequences there is this for the surgeon—that the brain is not a particularly sensitive organ to handle. Now the skin is : and one of the dangers of a superficial burn, for instance, is that many injurious influences pass from the damaged cutaneous nerves to the brain, producing some kind of malnutrition which expresses itself in what we call shock, and may have fatal consequences. Thus the skin, and all organs whatsoever which are richly supplied with sensory nerve-endings, must be cautiously treated by the surgeon, and irritated as little as possible. But just because the brain itself is not supplied with sensory nerve ends, the handling of it does *not* send impulses to disturb the nerve cells which lie so very near its surface. The exposed brain is insensitive to touch and pain if handled without anæsthesia, and it thus submits to a moderate amount of manipulation in surgical procedure without any of the consequences

which might be expected to follow the touching of the centre of all sensation.

There are thus none of the antecedent reasons which might have been anticipated against the surgery of the brain, nor does it present any exceptional problems. The cranium has to be passed through, and the surgeon must necessarily produce a compound fracture of the skull. As we have seen, this may be done with confidence here, as in other parts of the body. For some purposes a whole flap, not merely of the scalp, but of the subjacent cranium, may be turned back, so as to allow extensive exposure of the brain surface.

It is not to be denied, of course, that in any case this is a serious procedure, and it is commonly confined to the meeting of indications of great gravity, such as the occurrence of raised intra-cranial pressure, leading to compression of the brain and immediately threatening life. Intra-cranial abscesses, derived from the ear or elsewhere, may be dealt with, and tumours of various kinds may be removed with greater or less success. But there is one particular operation, of quite exceptional interest, which is performed in this region for what is apparently much slighter cause, and which illustrates much better than any other the powers of intra-cranial surgery as it has been developed, above all by Sir Victor Horsley, in recent years.

The familiar malady called neuralgia, which a French physician has described as "the cry of the nerves for better blood," occasionally assumes a very severe and intractable form. Improvement of the general health and treatment with iron to raise the quality of the blood, prove futile. The various anodyne and hypnotic drugs fail, and the life of the

patient becomes one of indescribable anguish. In such cases resort may be had to surgery, in which there is evidently some hope, since painful nerves can at least be divided, if nothing else is of any avail. Sometimes the surgeon may simply divide those branches of the fifth cranial nerve which go to the jaws, and it may be that this measure will suffice. In other cases—probably in the majority of this intractable type—mere division of the branches of the nerve is of no more use than division of the branches of the ulnar nerve in the fingers would be of use in preventing the symptoms produced by hitting one's "funny bone." The "funny bone" is really the ulnar nerve as it passes behind the elbow, and a blow delivered there causes sensations, more or less painful, which are referred to the fingers, but have not their origin there, nor can be affected by anything done there.

Similarly, in the cases of neuralgia under discussion, it appears that the seat of the trouble is not, as it usually is, in the branches or terminals of the fifth nerve, but higher up. The commonest cause of neuralgia is dental decay, and such neuralgia is to be treated by dealing with the teeth. It could also be effectively controlled, of course, by dividing the branch of the fifth nerve which conveys impulses to the brain from the peccant part of the jaw. But in the cases we are considering it appears that the seat of the malady is in a collection of nerve cells, lying under cover of the brain, which is called the Gasserian ganglion, and from which there run to the jaws and elsewhere those branches of the fifth nerve to which the pain is referred. The neuralgia is really a symptom of what is presumably a species of degeneration of the Gasserian ganglion; and there

is really no feasible way of dealing with it short of the heroic project of removing the ganglion altogether.

This excision of the Gasserian ganglion is the brilliant operation by which Sir Victor Horsley and others have been able to restore the value of life to so many elderly persons in recent years. It is a truly remarkable feat. The first case in which I saw it performed was on an old man of eighty-nine, whose life was and had for some time been absolutely worthless by reason of his neuralgia. The skull was opened and a large area of the brain exposed; the surgeons worked slowly and with great difficulty, step by step comparing the anatomical features they met with those of a skull held in a parallel position before them. At last the superincumbent portion of brain was turned aside without undue laceration, and the Gasserian ganglion exposed and removed. The patient made a good recovery, and though he wandered a little for a few days, he contrived to swallow six eggs daily, to mention nothing else, and soon came to himself, minus his neuralgia.

It need hardly be pointed out that there is a pair of fifth nerves, each with its Gasserian ganglion, and that only one can be reached by one operation; but there are many cases where the symptoms are one-sided, and the performance of Horsley's operation effects a cure. Nor does it need to be insisted at this stage that the performance of such an operation except under the most perfect aseptic conditions would be quite out of the question. In the first place, if microbes were introduced they would set up meningitis, that is to say, inflammation of the meninges or lining membranes of the brain, which are very much encountered and dealt with in this operation. In the second place, the use of antiseptics

such as carbolic acid or mercuric chloride, which are intensely powerful nerve poisons, is evidently quite out of the question in dealing with the tissue of the brain itself. Nothing but sterile salt-solution, closely similar in physical and chemical properties to the natural fluids of the brain, and maintained at the temperature of the blood, will satisfy the surgeon who wishes for success in such a very difficult and responsible undertaking as this operation; and this means that the precautions taken to render everything, including the scalp of the patient, aseptic, must be as thorough and as perfect as possible.

If we take everything into consideration, it must probably be agreed that the operation which has just been described is the most remarkable and admirable feat in the whole range of surgery at the present time. Much more formidable proceedings have been successfully undertaken in the lower animals, where the responsibility for failure does not exist, and there is no reason to suppose that we have reached the limits of surgical possibility, nor that some of these operations may not some day be justifiably performed upon the human subject; but at the present time this is the furthest that surgery is entitled to go, and only those who have seen the operation and realised a few of its difficulties can appreciate how far that is.

The surgery of the ear is also well worthy of mention in this region of the body. I do not mean the external ear, though it is true that cases of grafting this organ have been reported which are, at least, illustrations of the meaning of the aseptic principle. The external ear, however, is not the ear, nor anything like it. The real ear is contained inside the hardest bone in the body, hence called the petrous temporal bone, and it is connected with the nose and throat by means

of a narrow canal called the Eustachian tube. This anatomical fact is of enormous pathological significance, for it invests with special risk every infectious condition of the nose or throat. Typically in such a common malady as scarlet fever, certain organisms of ordinary inflammation are apt to join forces with the hitherto unidentified microbe that produces the original infection. Very often the inflammation in the throat spreads along one or both Eustachian tubes, the microbes find themselves in that air-chamber inside the temporal bone which is called the middle ear, and there is set up middle-ear-disease, with all its possible consequences. There is terrible pain ; the drum of the ear is perforated and a discharge appears externally, the child being deafened for life ; the roof of the middle ear, only a thin plate of bone, may give way, and meningitis or an abscess of the temporal lobe of the brain, which lies over the middle ear, may follow ; and very often the infection spreads into the mastoid portion of the bone, which is the familiar rounded projection behind the external ear.

None of this should have happened, and I purposely recount some of the pathological details in order to insist that measles and whooping-cough and scarlet fever, and even severe colds in the head in children, must be treated far more seriously than they are now, if we are to do our duty. Whenever the nose and throat are involved in inflammation there is risk to the middle ear, in consequence of the existence of the Eustachian tube, and this risk is one to which no limits can be assigned. Further, middle-ear disease does irremediable harm to the hearing. The surgeon may do great things, but he cannot repair a perforated ear-drum, and it is a most serious calamity when

such perforation occurs. If we rightly regarded measles and other complaints which endanger the middle ear, we should treat them with assiduous care from the first, paying scrupulous attention to the condition of the mouth and nose. We should thus undoubtedly prevent any aural complications whatever in practically all cases, and the question of surgery would fortunately not arise. There are permanently deafened children all over the country, and plenty more being made every day for lack of knowledge and humanity and real statesmanship in this respect, and it is not surgery that will provide a remedy for such cases in the future.

By the time when the surgeon can be of any use, the hearing has already been impaired for ever, and that is sufficient reason for insisting that these cases ought never to go so far. But they constantly do, and then the surgeon can be of enormous service. When all the palliatives have failed, he is called in, and performs a radical operation which puts an end to the mischief once and for all, thus averting the possible consequences to the brain and the probable further deterioration of the hearing, if middle-ear discharge is allowed to go on indefinitely.

And here it may be well to refer to the surgery of adenoids. No doubt this is as far removed as could well be from the surgery of the Gasserian ganglion or the radical treatment of middle-ear disease. But the existence of adenoids directly bears upon middle-ear disease, and is in any case a practical matter excelled in importance by none within the province of minor surgery.

"Adenoids" or adenoid growths are exceedingly common in the throat and nose, and many observers consider that they are far commoner than they used

to be. A very large proportion of modern children, of both sexes and in all classes of society, suffer from them. They may occasionally disappear of their own accord, but commonly they remain throughout later years to witness the permanent damage done by them during the period of development. The objections to them are very numerous. They cause mouth-breathing by their obstruction of the nose, and this leads to various risks to the lungs, since air breathed directly through the mouth is not filtered, moistened or warmed. The face is deformed, the nose becoming swelled, the skin puffy, the mouth permanently open. The child's blood is insufficiently aërated, and its growth and its intelligence are both interfered with in consequence. There is great liability to colds, which may infect the middle ear. The adenoid tissue is probably, even between the colds, a great nest for microbes, and it is likely that the child is thus being chronically poisoned by their products.

The modern surgeon has a very short way with all this. A brief inhalation of, say, ethyl chloride, causing practically instantaneous unconsciousness, lasting some ninety seconds or so, will suffice for the surgeon to remove the whole mass of adenoids in one piece, and, if necessary, the tonsils as well. For a week or ten days after the operation the child should be kept indoors, carefully away from the septic dust of the streets, whilst the denuded surface of the nose and throat heals. Thereafter all the symptoms are put an end to once and for all.

The value of this procedure may here be insisted upon for my own convenience as well as for its place in our discussion. The removal of adenoids is an operation which is constantly being recommended to parents, many of whom are not unnaturally

anxious about it, and my readers frequently ask my advice as to the necessity of their following their doctor's indications. The proper reply in every case when such a question is asked me is that one should first choose one's doctor and then trust him—no one at a distance can possibly be of any use: but when the subject under discussion is operation for adenoids it is always my duty to write back insisting as strongly as possible that this is one of the safest and most useful little procedures in the whole domain of surgery.

Civilised countries in general are full of children who require the removal of adenoids. In Great Britain at the present time we have got so far as to inspect our elementary school children, and medical inspection has demonstrated that we are attempting to educate hosts of helpless children who have central adenoids and suffer from colds in the head—which they hand on, after development, to their neighbours—or lateral adenoids, which make them deaf. But we draw the line at this point. Not to know that a child has adenoids, and consequently not to treat it—that is intelligible: but to spend money and skill on ascertaining their existence, and then to do nothing—that is unintelligible, but it is our present practice.

Truth to tell, directly we come to consider modern minor surgery, with its possibilities, we discover that we have a great duty, hitherto neglected, towards the nation's children. Their eyes, ears, teeth, noses and throats are in need of surgical help, not in thousands but in millions of cases, and we are not giving it them. This ceases to be defensible on any ground, the instant that the power is put into our hands, as Lord Lister and his followers have done. Our duty is measured by our powers, and our powers are

far greater than any but the few realise. For our failure to use them, not only the children themselves, but we, and our more fortunate children in their turn, pay and will pay a heavy price. These children whom we now neglect the recruiting sergeant will shortly reject, and later we may study them at our leisure in prison and workhouse and processions of the unemployed. If we want soldiers, sailors, citizens, fathers and mothers for the future, we must attend to these children now. The policy of those who promise us everything we may desire by means of military training is to be rejected summarily and contemptuously when we remember, first, that it leaves out the more important sex altogether, and second, that it has yet to prove its capacity to grow new teeth or ear-drums or eyes.

The powers which are now in the possession of the modern surgeon, which are not confined to a few men of exceptional talent and opportunity, but are the common property of all properly trained practitioners, make it a national duty to provide for their application to the nation's children, and this can be effectively done in one way and in one only. The out-patient departments of the hospitals, in any case atrocious anachronisms which ought not to exist in the age of Pasteur, cannot possibly cope with the need. The experiment has been tried by ignorant or selfish authorities and has egregiously failed, as every competent person knew it must. In connexion with every elementary school in the land there must be a school clinic, such as they have in Germany, and already in a few places in Great Britain. Here the surgeon will find his most beneficent field of action, and the consequent health and efficiency of the population will repay the cost many

times over. The total number of elementary school children at this moment in need of simple Listerian surgery is enormous, and the failure to deal with it simply means an enormous burden later on.

One particular case of the application of Listerism is worthy of our special consideration for its national importance. I refer to Listerian dentistry. We remember that the surgeon's duties, confined to blood-letting or little more, were once combined with those of the barber. Nowadays the surgeon has established a claim to our respect and obtains it. We should now realise that the dentist of former days has evolved and that there exists in his place the dental surgeon, a practitioner of high importance to the individual and the State.

When surgery meant blood-letting little honour could attach to it: when dentistry meant the extraction of teeth, by means of the blacksmith's brawny arm, it could claim little respect. But the case is very different now, though the unfettered practice of unqualified dentistry is a very grave handicap upon the progress of the profession, and obscures the significance of the change which has been brought about in recent years. The modern dentist, of the kind whom we need in our school clinics, is a surgeon, Listerian in training and practice, who specialises in the surgery of the teeth and gums. The extraction of a tooth is to him a last resort, a confession of despair, just as the amputation of a limb is to the general surgeon. His object, like that of all good surgery, is conservation, and his enemy is the microbe, the enemy of surgeons in general.

No doubt there should be no such thing as dental decay. But unfortunately we have to accept the facts as in large measure uncontrollable. The hygiene of

the teeth, which is essentially Listerian, will do much for them, and so will a wisely-chosen diet, which gives them enough work to do. There should certainly be no such thing as dental decay due to our permitting a child to go to sleep with chocolate or soft biscuit embracing the necks of its teeth. The consequences of our present neglect of dental hygiene are not to be gainsaid, and no kind of surgery is the real remedy for them : but there will apparently always remain, in civilised communities, a very large number of persons whose teeth decay in spite of all precautions. We cannot entirely revert to a primitive diet, such as is diet and dentifrice in one ; and even if we could, it may be that many of us are destined to have bad teeth in any case, having inherited the tendency from our parents. There is something to be said for the view that, in part at least, the present prevalence of dental decay is due to the fact that persons with naturally non-resistant teeth have not been eliminated by natural selection in recent generations as they would have been in the absence of modern cooking and modern dentistry. It is probable, therefore, that the problem of dental caries will remain with us, and it is much more likely to become accentuated in the future than to disappear.

Here dentistry of various kinds steps in. The oldest and rudest is that which simply removes any tooth which persistently gives pain, and of this no more need be said than that the modern dentist, in the relatively few cases where he is compelled to perform an extraction, should certainly be Listerian in his after-treatment, and keep the mouth clean with antiseptic washes, so as to prevent the patient from " catching cold," as he calls it, in the wounded gum.

The more advanced forms of dentistry are conservative, as distinguished from the dentistry of extraction, which is, or ought to be, literally radical. One form of conservative dentistry may be styled mechanical. It is the so-called American dentistry, and a very clever thing it is. A dentist of this school does not regard a tooth as in any sense a living thing, but as a hard inanimate object which is to be dealt with on mechanical lines. He does not look at dental decay as in any way a problem in pathology comparable to the other morbid consequences of bacterial activity, but rather as a mechanical injury due to attrition, hard particles in the food or what not; and of course it follows that he does not contemplate the possibility, which would naturally present itself to a surgeon, that any of his manipulations may involve lowering the vital resistance of the tooth. Thus in order to get access for his unquestionably skilful and elegant technique, he is quite willing to wedge teeth apart to any extent, being totally unaware that he is thereby damaging the vital connexions of the root, injuring delicate blood- and lymph-vessels, and nerve fibrils, so that in time the root will atrophy, and be unable to support an artificial crown should one be desirable at a later date. It is not asserted that the best American dentists do this sort of thing nowadays, nor that their methods differ essentially from those of the best dental surgeons elsewhere; but the so-called "American dentistry" which is advertised in Great Britain is, generally speaking, a thing to shun, chiefly on the ground, already indicated, that the operator looks upon his task as a purely mechanical one, whereas it is really a problem in applied physiology. It has only to be added that the high development of mechanical

dentistry in America, and the inventiveness of American dentists in the matter of instruments, have been and are of the greatest value to the best scientific dentistry of the present day.

Modern Listerian surgery is as conservative in dealing with the teeth as in any other part of the body, and proceeds upon the same assumptions. Its problem is to protect the tooth against microbes, which in any case abound in the mouth of the most scrupulously clean, and certain varieties of which, if present and active, are capable of forming acids, usually lactic acid, from such substances as sugar—whether taken as such or formed in the mouth by the fermentation of starch—with the consequence that the enamel of the teeth is slowly dissolved. The business of the surgeon in these circumstances is as far as possible to apply his ordinary principles of surgical cleanliness to the mouth ; and to operate on Listerian lines when his antiseptic precautions have failed, as they frequently will. Let us note how these two considerations work out in practice.

We have already seen that the process of sterilisation does not merely comprise, if it is to be successful, the free use of an antiseptic solution. The surgeon must use a nail-brush besides dipping his fingers in carbolic lotion. So also in the case of the teeth. The mechanical removal of microbes is the point of first importance. The diet of the lower animals and of savages, who use no antiseptic mouth washes, performs the cleansing process with admirable results, and we must imitate them, partly by the inclusion in the diet of such things as wholemeal bread and raw apples, partly by the judicious use of the tooth-brush after meals and, above all, before going to bed. Our dentifrice will be nicely adapted to the needs of

the case by being, first of all, solid, in the form of a powder, so as to aid the mechanical action of the brush; secondly, antiseptic, so as to kill microbes; and thirdly, antitoxic, so as to neutralise their toxins. In this case the toxins are simple acids, and therefore our antitoxin is merely chalk or bicarbonate of soda—which, being alkaline, are sufficient for the purpose.

In his operations the dental surgeon lays it down as a first principle that he must safeguard the vital resistance of the teeth. He knows that the crown of a tooth is chiefly nourished through the vessels of the pulp, and the root through the vessels which pass into it from its surroundings. He knows also that any injury to the nerve or blood supply alters the vital condition and even the chemical composition of the tooth, so that its resistance will be impaired; and therefore he will not wedge teeth apart in such a fashion as to condemn their roots to die of starvation, and be worthless for crowning purposes at a later date.

On the more positive side the services of Listerism in modern dental surgery are of the highest order. The skilled operator need scarcely ever remove a tooth; and in many cases he may prefer the antiseptic medication and sealing up even of an apparently worthless root, to its extraction, for he knows that the removal even of a root favours atrophy of the jaw and consequent ageing of the face. Even severe inflammation of the pulp, leading to death of the contained nerve, need not entail the loss of the tooth, for the surgeon may penetrate to the canal, remove the worthless and usually highly bacterial content, and by careful antiseptic dressing of the canal he may save the tooth or, at the least,

the root. My copious experience in dentistry has been entirely that of a patient, and I cannot discuss all the various applications of Listerism in this field, which are familiar to the modern dental surgeon, but enough will have been said to show that Listerism is of high and increasing value here, and that its very existence is a sufficient reason for demanding that the status of the dentist should be raised, that unqualified practice should be controlled by law much more stringently than at present, that every dentist should be a fully qualified surgeon, specialising in dental surgery, and that such a surgeon should be in charge of a dental clinic in association with every school where the nation's citizens, of whatever class, are being reared.

Briefly, the facts in London at the present time are that there are not enough dentists to be had even for the purpose of extracting the unsavable teeth of the three-quarters of a million of children in our elementary schools; and of course there does not begin to be any provision of dentists in sufficient numbers to practise what is really required. The few dentists, even in this wealthiest of cities, who possess really adequate surgical qualifications, are as a rule much overworked by the demands of the upper and middle classes, and the dentists able to save the teeth of the children of the lower classes simply do not exist. A few years later these children will apply in large numbers for admission to the army and will be rejected by the medical officer on the ground of their defective teeth, which conservative Listerian surgery could easily have saved a few years before. If only the champions of compulsory military training could themselves receive some training in the alphabetical facts of our national existence!

Listerism has called into existence in our day a new branch of surgery which may be called plastic, cosmetic or constructive, and of which many striking illustrations might be cited.

A representative case of this type of surgery is to be found in skin-grafting, which is now practised every day, and confers vastly more benefit upon humanity than the name at all adequately suggests. We should require a little time for sober consideration of the advantage of possessing a skin, before we could rightly estimate the boon which skin-grafting daily confers upon many persons, young and old, who without it would be condemned to grave permanent discomfort and danger. Here is an instance of a kind of surgery which will always be wanted, for there is no reason to suppose that mankind will ever be entirely immune from accidents, even if the opportunities for bad burns become less frequent, as they doubtless will. It is probably in cases of burning that skin-grafting is most often demanded. Many accidents involve considerable destruction of the skin, and occasionally the surgeon, at the conclusion of an operation, may find that there is not enough available skin for the edges to meet. But burns are of everyday occurrence, and it is, of course, the skin pre-eminently that they tend to destroy. A burn may be severe, intensely painful, and dangerous, without involving destruction of the skin; but many burns extend somewhat deeper and, whilst probably much less painful, the nerve-ends being destroyed, completely kill the entire thickness of the skin. In such a case the general laws of repair have to be reckoned with. Skin is a specialised structure, and can by no means be formed except from existing skin, or from those elements of the germ cells which

are destined to give rise to skin. If, then, the whole thickness of the skin be destroyed, the subcutaneous tissues, thus exposed, are entirely impotent to form any substitute, however imperfect. The result is an ulcer, and if this is to become what the surgeon calls a healing ulcer it must be covered over by the growth of the skin at its margins. An attempt in this direction will be made in every case where the principles of Listerism are applied and where the patient's powers are not destroyed by diabetes or alcoholism or some other form of poisoning. But when the area of destruction is a large one, as very often happens in cases of burning, the marginal skin is not equal to the tremendous task of covering over the whole area. In such cases skin-grafting is the only hope for the patient, and this procedure can now be successfully carried out upon the most surprising scale. Thus in a recently reported case practically the whole of the back of the burnt patient was successfully covered by means of skin-grafting, after a series of operations which covered a period of fourteen months. The skin to be grafted must, of course, be obtained from somewhere, and the patient, if otherwise healthy, or friends may be called upon for contributions. These are taken in pieces of such a size that the skin of the bereft individual may be counted upon to make good the deficiency, and though the new skin thus formed will not possess hairs or sweat-glands that is of small importance.

The failure or success of this operation depends, above all, upon the application of Listerism. The portions of grafted skin, set down upon the surface of the ulcer, will "take root," so to say, and grow outwards until they join hands with each other and with the native skin of the patient, only if their

vitality is not impaired. On this account the surgeon must scrupulously keep microbes out of the case altogether : otherwise his grafts will die where they are placed, and be worse than useless. But, further, if microbes would produce poisons fatal to the survival and growth of the grafts, it must not be forgotten that such antiseptics as carbolic acid or corrosive sublimate will be liable to produce just the same result. Clearly, then, skin-grafting is an operation which demands the most perfect developments of aseptic surgery, and it is since the practice of aseptic surgery was devised and made efficient that skin-grafting has become so generally successful and so widely beneficent. There are many different ways of performing the operation, and surgeons may discuss the best source of the skin, the thickness to be removed, the size and distribution of the grafts, and so forth : but the vital point is that the *vis medicatrix Naturæ* shall be utilised in every case, and for this purpose it is the aseptic method that matters. If that be successfully practised, the rest will follow.

No sooner had surgeons realised the possibility of grafting skin than, as might be expected, they began to inquire into the possibility of grafting other tissues : and the observation of one successful case of skin-grafting suffices to remind the thoughtful that there is a foolish scepticism as well as a wise, though it very seldom receives the castigation it deserves. This whole question of grafting is not merely important from the point of view of practical surgery, but also interesting from the point of view of experimental physiology, for it enables us to extend indefinitely our comprehension of physiological processes and possibilities. Enough stress has not, indeed, been laid on the enormous services of Listerism

as an instrument of the physiologist, enabling him to learn, by observation in the case of mankind, and experiment in the case of the lower animals, many facts otherwise inaccessible.

Generally speaking, it is as we should expect, that tissues, organs, structures, to be successfully grafted must be derived from an individual of the same species as the person of whom they are now hoped to form part. This, however, is by no means an invariable rule, and many portions of structure derived from the lower animals may be caused to live in animals of other species or in man.

This grafting may be extended to entire organs or considerable portions of organs, and practised with success provided that perfect asepsis be provided, for the two sufficient reasons which we have already discussed in the case of the skin. Thus it is possible to graft the thyroid gland, carefully removed from a living animal, in the body of another animal, already deprived of its thyroid, and thus prevent the symptoms which follow when an animal attempts to live without the presence of the secretion of that gland in its blood. In the human diseases called cretinism and myxœdema the patients suffer from thyroid deprivation, and it might be quite possible to cure them by the transplantation of thyroid tissue from another individual, if it were not that the daily administration of thyroid substance, as part of the diet, will effect all that is necessary, without risk or disadvantage. The transplantation of many other organs is now being studied, and the consideration of the possibilities leads to some bizarre conclusions when we consider the possible transplantation of the organs in which the germ-cells of the individual are contained.

To turn to the more practical applications of these methods, we may note that much can be done in the way of tendon grafting or transplantation. A tendon is a structure chiefly mechanical in composition, and entirely mechanical in function, being simply the rope through which a muscle exerts its pull, and we need not be surprised at the possibilities in this direction. The transplantation of bone might be thought to be of the same order, but bony tissue is very much more vital than we suppose, and success is not so easily obtained in this case. The transplantation or grafting of nerves is also of interest. If we think of a nerve as merely a wire, we might expect to make good a breach of continuity in a nerve by splicing it, or joining the ends, with a piece of nerve from any source. A nerve, however, is a living projection from, and integral portion of, a nerve cell: or rather, what we call a nerve is a bundle of many such projections. If a nerve be thought of from this point of view, the project of nerve-grafting takes on a new aspect: nor can we expect to obtain simple and immediate results, however clean and deft our procedure. But the operation may well be worth performing nevertheless, for it means providing a bridge or scaffolding, along which the severed nerve fibres which are still in vital continuity with the cells from which they spring, may grow, and strike their old sheaths—now filled with mere droplets of fat, for nerves cut off from their parent cells degenerate and die—and fill those sheaths again and reach down to their old appointed terminals: all of which is sufficiently wonderful to consider, and for the paralysed patient who finds that he can move his fingers or what not again, very pleasant to experience.

In other directions reconstructive surgery may reach a very high pitch of achievement. In a recently reported American case, the face of a patient was practically destroyed by machinery, and the surgeons set themselves to the task of reconstructing it. If we are to understand their success, or even their making the venture, we must remember that the facial destruction was due to an accident, and that they had healthy tissues on which to work. There is at least one form of disease, still common, to say nothing of leprosy, where the face may be destroyed, but here it is rotted away by a process of poisoning which, even if arrested, would not leave sufficient of the *vis medicatrix Naturæ* for even the aseptic surgeon to count upon with any confidence. But in the case under discussion there had been no such devitalisation, and it is recorded that the surgeons succeeded in transplanting enough muscular tissues and skin for the making of a new mouth, with which the patient could speak again; and finally, by the adaptation of one of his little fingers, they are said to have succeeded in providing him with a fairly presentable nose.

The modification of the nose, in any direction, is certainly well within the possibilities of modern surgery. There is, for instance, the hideous disfigurement of the so-called "gin-blossom" nose, which is not uncommon by any means even in persons who are temperate in the matter of alcohol. This can be readily shaved down to a suitable pattern, and will proceed to heal quite satisfactorily as a rule, without skin-grafting, for enough skin cells remain, after the overgrowth has been removed, to renovate the more modest surface which the razor leaves. If it were not for the unreasoning organic fear of

operation which is still so general, and about which something will be said in the next chapter, surely many possessors of these lamentably disfigured noses would avail themselves of surgical relief.

We have already seen that the surgeon does not fear to make a compound fracture, even of such large bones as the thigh-bone, when he has occasion. Plainly, then, it is possible to deal with the nose quite freely in cases where the possessors of noses which they consider redundant in their bony structure, are willing to undergo an operation for the sake of beauty. And the converse defect, this time literally a defect, may also be dealt with. Mr. Stephen Paget pointed out some few years ago the feasibility of increasing the bulk and correcting the shape of a nose by the insertion of paraffin in suitable quantity and of appropriate form under the skin. But, as we shall shortly see, the modern surgery of the nose can do things very much more worth doing than any modification of its external form.

The number and variety of surgical successes in these days is endless, and can scarcely be kept pace with, unless one devotes regular reading to the purpose. There is no occasion, however, to do more in these pages than will suffice to make the essential point clear to the reader. At a recent meeting of surgeons in Berlin, it was reported that the transplantation of an entire knee-joint from the body of a person just deceased to that of a patient whose own knee-joint had required excision for tuberculosis, had been successfully performed: and there is no end to the possibilities which such a record indicates.

It is hardly necessary to remind the reader that such an operation as the transplantation of a joint could only be performed successfully under the

strictest and most efficient Listerian precautions during every stage of the complicated procedure which would evidently be necessitated. One has only to consider the possibilities of infection in such a case, and the consequences of failure to control them, in order to realise what Listerism means for the modern surgeon. All the rest is subsidiary : daring, mechanical ingenuity, dexterity, swiftness, anatomical knowledge—all these could be found in the past, and are readily available to-day, but without Listerism they must fail.

Pity, then, the unwisdom and the miseries of mankind, that Greece should have achieved such great things in science, and that the great superstructure now built upon those foundations should have had to wait for so many centuries of disease and pain and folly, before men of the modern time—in themselves by no means superior to the Greeks—could build it. What a lesson for the enemies of science, and the champions of draped or naked superstition !

## CHAPTER XI

### THE RECORD OF A CASE

A RECENT surgical experience of my own may justify an autobiographical chapter at this point for several reasons. For one thing, the writing of the present book is, in part, an attempt to discharge my debt of gratitude to surgery for a very great service then rendered to me. Also the case was of a very common kind, which has been suitably treated by surgeons only within the last three or four years; and the operation in question is a particularly brilliant and notable illustration of the possibilities of modern Listerism. Lastly, my record of the facts may serve to remove the fear of operation from the minds of some who would be very much better without it. I shall attempt to describe my feelings and experiences as a patient, and to show cause for the undoubted fact that, being asked at any future date to undergo a surgical operation, I should do so with feelings very different from those which will shortly fall to be described. No doubt there are individuals who would have no trepidation before a first operation or a tenth: but I fancy that the majority of my readers will not belong to that minority.

Like a great many other people I had all my life been subject to colds, which were usually very bad ones, and lasted a long time, though they never interfered with my work or play. In the course of my

thirty-first winter, however, they became somewhat worse, one running into another, handkerchiefs being incessantly required, and new symptoms developing themselves. My breathing became asthmatic after exertion or on exposure to fresh cool air, and my voice began to be persistently hoarse. This last was, of course, a serious matter for one who, not to mention private efforts at what he calls singing, is constantly engaged in lecturing and public speaking. The customary method of ignoring all the symptoms, treating them with contempt and expecting them to disappear, failed in this case, and after coughing all the way to Scotland for a lecture tour, I consulted a specialist. No sooner had he looked into my nose than he declared that I was the possessor of a deflected nasal septum. This is to say that the partition between the nostrils, instead of being strictly in the middle of the nose and in one plane, was bent or buckled to one side. The consequence was that one nostril was too narrow and the other too wide ; but, more seriously, that a sort of mechanical ledge was present in the nose for the reception of microbes. Hence, primarily, my liability to colds. In the course of years these successive colds had lowered the vitality of the mucous lining of the nose, and there were further various hypertrophied and degenerated portions which acted as further breeding-grounds for microbes. The nasal irritation was setting up a congestion of the small bronchi in the lungs, leading to asthma, and also to the congestion of my vocal cords, which I had never had in my life before.

It seems probable that deflection of the nasal septum is not unconnected with the extremely common malady of adenoids, from which I had suffered, and which I had had well removed at the

age of seventeen. This deformity or maldevelopment of the septum is a very common thing, and probably a considerable number of persons in every hundred suffer from a greater or less degree of it, and they tend to display such symptoms as I did. Thus it is likely that several out of every hundred of my readers are now considering what is also their own case. It need hardly be said that the deflection is permanent and its effects cumulative, so that its victims commonly suffer from chronic laryngitis and are permanently hoarse by the time they reach middle life, whilst the colds and the liability to a form of nervous asthma further lower the vitality and must certainly shorten life on the average. Further, the removal of associated adenoids, or even of degenerated ends of turbinal bones, is only a temporary palliative.

The surgeon simply said that what would give me most relief would be a " submucous resection of the septum," an operation of which I had never heard. It is most unpleasant to be talked to like that. One pulls oneself together and asks what the operation amounts to, meanwhile feeling very strongly inclined to trust in something else. One thinks of accidents in the way of sepsis, of deaths from anæsthetics, of post-anæsthetic sickness, and several other such things, with instantaneous speed and keen imagination—which, in my case, had, of course, plenty of recollections on which to feed. The only alternative, said the surgeon, was to douche the nose daily with an antiseptic and alkaline lotion, and hope that the mucous membrane would recover its tone—but the chances of success were small.

I started out with the lotion, but was not encouraged by a second expert, who assured me that only the operation would be of any use. I had the

advantage, not open always to the layman, that both of these men were my personal friends, and that I could rely on their advice as absolutely disinterested. But I gave the douching a fair trial, with complete unsuccess: the long process of deterioration had gone too far, and something radical was required—the more especially as my voice became worse.

So I decided to have the operation, having first ascertained the facts of it. It is a device which was introduced only three or four years ago in Vienna. Up to that time the only way of dealing with a deflected septum was to break it by sheer force and then set it up straight in splints. The results were very poor, to say nothing of the prolonged pain and discomfort which the patient had to undergo. A leading objection was that the mucous membrane of the nose was always necessarily injured by the blow which was employed to break the septum, and that, in the course of healing, the beautiful cells, with fine living "cilia"—which is Latin for "eyelashes"—that kept the surface clean and clear, and the mucous cells which kept it moist, were replaced by flat epithelial cells, which became dry and the seat of crusts. These crusts were a nuisance when present, and the nose bled when they were removed. The exquisitely adapted normal epithelium or cell-lining of the nose cannot be successfully replaced by anything else. So as a rule patients suffering from this exceedingly common defect simply endured the consequences without substantial help from medicine or surgery.

So the matter stood until the Viennese rhinologist invented an operation which is highly typical of what modern surgery contrives and achieves. This is the operation of "submucous resection" of the

septum, and the point of it is that the surgeon makes a large flap of the mucous membrane, turns the flap up, and then proceeds as he will, until he is done, when he restores the flap to its place, securing it with a single stitch, and leaves the patient with the mucous lining of his nose intact, so that it is not liable to become dry or crusted or hæmorrhagic. As for the intervening process of "resection," which is thus performed underneath the mucous membrane and hence called "submucous," it is no less than the bodily removal of the nasal septum in its entirety, which is vastly better than breaking or leaving it, but of course involves much more interference and damage. This septum is composed partly of cartilage and partly of bone, especially in its upper portion. The bony septum is largely composed of parts of two of the bones which form the base of the skull. All this the surgeon removes, together with a wide and strong bony crest from the upper jaw. For this purpose he requires hammer and chisel, various gouges, a remarkable American knife, having a very short, balanced blade at the end of a handle, which is so made that it will cut in any direction towards which the surgeon presses, and a variety of other instruments. It need hardly be said that the consequences of infection by microbes in the course of such an operation would be horrible, the bones and air-cells at the base of the skull, the upper jaw and many other structures all being open to infection. Evidently no surgeon could contemplate such a procedure for anything short of desperate need, unless he could count on the perfection of his Listerian methods: but there are no other means of radical relief open to the many persons who are afflicted as I was.

Of course one went to a nursing home where the

proper conditions were available, as they are not in any private house, be it a palace. I wanted to hear Mlle. Destinn at Covent Garden on the night before, there being nothing whatever the matter with *her* vocal apparatus, but was instead compelled to go to bed at nine, as the anæsthetist preferred his patient to have a quiet evening. No food of any kind was allowed after ten o'clock. The lay reader may be strongly advised to acquiesce intelligently and heartily in all such instructions for himself or for a relative or friend before a surgical operation. A quiet preceding day, with bed at an early hour, nothing but a glass of milk later than ten o'clock—the preceding dinner having been light and simple—a dose of an aperient, however unfamiliar: these are some of the means which immensely simplify and safeguard the duty of the anæsthetist, and they greatly promote the patient's comfort after the operation. In my case there was little more to consider: but in many cases the fatigue involved in taking an anæsthetic badly, and in post-anæsthetic sickness, is much more serious than mere discomfort, whilst the movements involved may be gravely deleterious from the surgical point of view. Let us therefore be strongly convinced that due preparation of mind and body for operation is a most important and profitable proceeding. Of course in the majority of cases there is the added need, in some ways much more important than any of the foregoing, that the patient's skin at the site of operation shall be prepared, and to do this thoroughly, especially in preparation for an aseptic operation, may be a matter of forty-eight hours. Here again an intelligent laity will do well to accept the surgical estimate of the importance of this ritual.

It is to be noted that serious disasters, not short of death, have followed the failure of relatives to appreciate the importance of these matters. It is bad enough for a mother surreptitiously to give her boy an apple, less than twenty-four hours after an operation for appendicitis, as I have known done; but it may be much worse to fear that one's friend is being starved, and give him or her solid food shortly before an operation. Even if one could guarantee that the stomach would digest the food, there would still be serious objections to it: but the stomach of a person who knows that he is about to undergo a surgical operation will very likely be thrown out of gear by the notion of impending danger, and thus the case is still further complicated. And nothing can be more heart-breaking for the anæsthetist who has given careful and stringent orders than to have his patient sick under the anæsthetic, and find that the stomach, which should be empty, contains food, perhaps in solid lumps, which involves the danger of immediate choking or, scarcely less serious, the aspiration into the air-channels of particles of food which subsequently set up a post-operative pneumonia. The public cannot be expected to know these things without being told, and in these days the public cannot be expected to follow professional directions as if they were inspired and unquestionable. Therefore I have set down briefly some of the reasons why it is worth while to obey orders in the instance under discussion. I have every personal reason to know that they are worth while, having seen the effects of obedience and disobedience, and having experienced the quite remarkable advantages which follow from the observance of the best expert indications in the matter of anæsthesia.

To resume the narrative: I went duly to bed at an hour unprecedented since childhood, and slept quite well. In the morning, breakfastless, I sat up in a chair for half an hour whilst my nostrils were painted with cocaine and adrenalin, those remarkable drugs which contract blood-vessels and, in such cases as this, are invaluable to the surgeon, who is practically able to perform an operation in a part of the body peculiarly well supplied with blood, as if there were no such thing as blood at all. Then I walked into the next room, and sat in a chair, and was shown the various novel instruments to be employed, and found it difficult to be nervous—as I would beg the lay reader, or indeed any reader who has not been through the experience, to observe—*because no one else was.* They were cheery, competent, prepared, confident, accustomed. Only subsequently did one realise the immense value to the patient of this psychological attitude on the part of those who surrounded him. The whole affair was so palpably customary, straightforward, assured, in their eyes, that one felt that any display or even any internal feeling of doubt or glumness would be bad manners and out of the question. Further, I had the advantage of having watched the same surgeon and the same anæsthetist at work in a most finished and brilliant affair of some ninety seconds when removing adenoids from my small daughter: and that, no doubt, was a help. Anyhow, I wish to insist that the whole of the preliminary proceedings were utterly different in anticipation and in fact; and I hope to comfort a few readers, when their turn comes, by this testimony. Before the time came, one pictured the preceding night, the entry into the operating-room, and so forth, as very formidable and terrifying

experiences. They were nothing of the sort. When the time came, they were interesting, dramatic and somewhat amusing, rather than anything else : and, as I say, one could never again indulge such anticipations after this experience.

One could not really fear the anæsthetic, even though in this operation it has to be taken whilst one sits or is propped in a chair. I knew my alimentary canal was empty, and that I was a lifelong tectotaller, and could at any time run ten miles. Three seconds before the mask was applied to my face, my heart began to make its action felt, and my last thought was of Prof. James's theory that we feel afraid because the heart palpitates, rather than that the heart palpitates because we are afraid. My verdict was then, and still is, that James was wrong : but that the palpitation accentuates the fear. In less than five seconds more I was unconscious. My admirable friend had sent me off with nitrous oxide or laughing-gas, such as dentists use, and continued the proceedings with chloroform.

There can be no doubt that this is the right procedure. Ten years ago they were still using, in Edinburgh, the " open method " of administering chloroform which was the original method employed there by Sir James Simpson, and I have vivid recollections of long periods during which the patient slowly relapsed into unconsciousness, with no continuous and even passage thereto, and with all manner of speech and struggling, none the more pleasant or less pronounced for the alcoholic habits of many of the patients. All this kind of thing uses up the patient's strength, discomposes his circulation and respiration, greatly predisposes to chloroform-sickness during and after the operation, with its

attendant risks, and involves the inhalation of far more of the drug than would otherwise be necessary. Further, this prolonged period of anxious struggling, "going under" and coming out, and being reassured by the administrator, and told to take long breaths—must all be very unpleasant for the patient. No doubt many sensible, non-alcoholic, non-nervous patients, having the drug carefully administered by the open method, will go evenly under, but even so this cannot compare with the initial use of nitrous oxide, which sends the patient off with his third or fourth inspiration, and does so with absolute safety. Nothing has struck me more than the contrast between this experience of my own in 1910, and what one daily observed and participated in, from another point of view, in Edinburgh only ten years earlier. And the practically instantaneous loss of consciousness was no less advantageous than the subsequent consequences of this modern method of inducing anæsthesia.

During the operation, which lasted for about half an hour, and was conducted in a chair, which involves much more strain upon the heart than the lying position, and would be vastly more inconvenient if the patient were sick, this particular patient gave no anxiety at all, but breathed as teetotallers do under anæsthetics, and had no gastric disturbance, having been duly prepared in the fashion described. I know nothing whatever from my third breath, or so, of the anæsthetic, to the moment when I found myself lying on my side in bed, and heard a nurse's voice saying that it was all over. And now came the full virtue of all the skill and forethought to which I had been subjected. I never had a qualm, my head was perfectly clear and did not even ache, and yet I

had been under chloroform for half an hour, and had had chisels and things knocking about at the base of my cranium. In three hours I was scribbling a letter, and not long thereafter was swallowing a cup of unsweetened tea.

I had much feared the subsequent discomfort and pain. Pain there was none, and the discomfort went for nothing against the satisfaction of knowing that the operation was over. This, one supposes, must be the common experience : the anxiety and apprehension are gone with returning consciousness, and anything to be borne thereafter is child's play. I had not a wink of sleep that night, nor the next, owing to sheer excitement : and as there never was a better sleeper, I am certain that in other circumstances this would have been a most grievous and almost unendurable affliction. But the blessed thought that the thing was done made the sleepless hours easy. My evidence certainly is that, taking the ordeal from the first to the last, the anticipation was by far the worst part of it. Doubtless things would have been very different in the absence of skilled preparation, perfect administration of the rightly prescribed anæsthetic, and unfailing aseptic technique on the part of the surgeon : but my present business is to insist that, given these conditions, such an operation is not really a thing to be feared as one inclines to fear it. I could not possibly feel anything more acute than annoyance and fear of boredom if I had to undergo the same operation again, and the reader may be assured that very much more serious operations may be undergone, in these days, with little, if any, more " suffering " than I was called upon to endure.

But before we extract the moral from this tale let the sequel be duly told. I was allowed to go home in

three days, and was absurdly "slack" for another four—quite content to lie about and read in the garden, just as if I had contracted acute "potterer's rot." On the seventh day, my appetite for things returned and I went to Lord's to see a cricket match—having been previously warned against infectious dust. Of course I caught a cold, and of course it was a very bad one. But when I remember the colds of the past, I think I may safely boast that it was my last. I have had one cold in eleven months since then, having travelled all over the country to speak, by day and night, hatless and very lightly clothed. It was a trivial cold, which would have been, a year before, too trifling an aggravation of my ordinary state to notice. The asthmatic symptoms slowly but certainly disappeared, beginning to do so at once, and taking their departure altogether after about six months. This was the period for which, I had been told, one must wait for the full benefit of the operation. By that time my voice had perfectly recovered, and the vocal cords were found to be normal: to say nothing of the disappearance of a hideous nasal tone which had latterly become unavoidable. Some eight months after the operation I was examined for life insurance, and found in first-class physical condition in every respect. But before the operation I had been advised to have my sputum examined for tubercle bacilli: and certainly no office would have accepted my life at that time, considering the obvious condition of my nose, the sound of my voice, and the whistlings in my chest.

Trivial though the whole trouble might be reckoned, it was of the first importance to myself, threatening my work and pleasure, and involving organs which might later have been very readily attacked in

consequence by the tubercle bacillus. The service wrought me by Listerian surgery was complete, it was safe, it was final, it was irreplaceable, and it was highly educative.

The reader will do well to profit by my experience. Operations are not to be feared as we are apt to fear them. The patient recovering from an anæsthetic properly administered does not feel nearly so bad as he appears to the onlooker: he probably feels immensely pleased with himself, and very naturally so. Yet my surgeons told me of various cases where, for instance, a professional tenor, whose voice was threatened, and was in any case never to be counted upon, owing to his liability to colds, did not dare to have his deflected septum removed, because a surgical operation was in his eyes a desperate matter. He was a sample of a very common type. Numerous cases are always occurring where people refuse altogether operations which would greatly serve them, and for which no substitute exists, or where they postpone inevitable operations until it is too late. Surgeons have to reckon not only with patients but with patients' friends; not only with the patient's own fear, but with the fear which his friends communicate to him. Thus operation is refused, or is unduly or disastrously delayed; or when the patient does undergo it he prejudices his chances by fear, which prevents him from sleeping before it, and disturbs the taking of the anæsthetic.

I would incline to say that not even the witnessing of many operations will suffice as first-hand education; one must undergo an operation oneself, which is a most illuminating and entirely different experience. Short of that, one must be instructed by someone who has the necessary experience, and it is that

instruction which I now offer to the reader. Let him consider the record of this case, and reconsider his attitude towards operations both on his account and on account of any whom he may love. And let it not be to his danger or discredit or lasting regret that he delayed or refused operation on himself or another, when with more wisdom he would have acquiesced, not so fearfully.

Lastly, let us observe how very valuable surgery is in such a case as this, and how entirely irreplaceable it is. Practically all the victims of deflected nasal septa hitherto have been helpless—voice, comfort, health have in greater or less degree been destroyed, and there was no remedy. The most skilful and patient medication fails : surgery, if it be sufficiently daring and skilful, succeeds wholly. The newspapers contain advertisements of remedies which are to relieve nasal catarrh and its consequences, without operation ; and such advertisements, together with the rarity of first-class surgeons, and the public fear of operations, and carelessness in seeking proper diagnosis for such things as cold-in-the-head—mean that probably not one person in many thousands who really need this operation and who will get no relief without it, ever obtains the relief I did. It is time we honoured and recognised and made available for ourselves and others boons to human life of so high an order as this : and if only one reader, in consequence of this chapter, profits as I did, it will have been well worth writing. But I hope there may be many.

## CHAPTER XII

### SURGERY AND ALCOHOL

It may be stated in general terms that, ever since time began, man has employed for medical purposes all the substances known to him which had a marked influence upon the human body or any of its functions. Ignorance has no resort but to grasp for salvation in the dark at whatever promises a hold. Thus one remembers a medical student saying that he intended, when he got the chance, to begin at the beginning of the alphabet and test every known drug until he found one—which must surely exist—that should cure consumption. That is the method of ignorance in matters of disease, which has prevailed until almost our own time. It is therefore natural that alcohol, the most easily obtainable and widely known of all drugs, should have been used in disease as in health by mankind in all times and places of which we have anything like adequate record. In the judgment of those who directly concern themselves with the scientific study of alcohol to-day this unholy alliance between alcohol and the art of healing has been condemned root and branch, in principle and in detail, by modern knowledge. Our concern here is with surgery alone, and though it is doubtless in non-surgical affections that alcohol has been most largely abused, yet the case which stands in relation to surgery is of the utmost interest historically and of the

very highest importance in its bearing upon the best surgical practice to-day, and especially upon the difference between the best and the second best.

Alcohol belongs to the class of what are called by toxicologists the protoplasmic poisons, together with a considerable number of other compounds, and also certain elements, such as arsenic and phosphorus. It appears to be essentially of the nature of a poison to all forms of living matter, animal or vegetable. It is therefore necessarily an antiseptic, and we have historical evidence, of which only one instance need be cited, that what we now recognise to be the antiseptic property of alcohol has long been known. The instance will suggest to us the conclusion at which we shall arrive when the argument has been completed. It is that alcohol is of great value externally in surgery but works great injury when used internally.

In the parable of the Good Samaritan it is described how a wounded man was found by a kind traveller who, though of a hostile sect, "had compassion on him, and went to him and bound up his wounds, pouring in oil and wine."* I am not prepared to choose between orthodox and heterodox explanations; but the fact is that in this account, meant to illustrate right and kindly treatment, alcohol is described as having been used as an external antiseptic, but the Good Samaritan is not described as having administered it internally. That point need not here be pressed, save only to say in passing that if the Good Samaritan, seeking to do his very best for his patient and having alcohol at his hand, used it to cleanse the wounds, but deliberately refrained from employing it internally, his surgical practice

* St. Luke x. 30–37.

was in so far better than any but the very best in our own time. The modern surgeon would not employ any sweet oil in this fashion, knowing as he does that for various physico-chemical reasons, hitherto imperfectly elucidated, such oils, themselves very far from antiseptic, interfere with the action of antiseptics. Various bacteria can grow in carbolic oil, for instance. Our concern here, however, is not to pronounce upon what was doubtless narrated as indicative of the best surgery of the time, but merely to note that the use of alcohol as an antiseptic was known in Palestine in the time of Christ ; as doubtless in many other parts of the world at that time and before it. A survey of the whole evidence available would convince anyone that the practice, based upon genuine observation, was, we need not doubt, justified by results. There are good reasons, also, for the employment of oil, though it has the disadvantages that have been named, and it is only just in our own day that we are learning how to obtain the value of oil with due deference to the antiseptic principle. At any rate, it is of interest, certainly historical and possibly theological, to observe what the practice of the Good Samaritan in the parable was. Having wine, anyone nowadays playing this part would begin by administering it internally, and would be thought miserly and cruel if he did not. The internal administration of an alcoholic drink is the very first thing that would be thought of and done by ninety-nine persons out of a hundred in such a case. The verdict of modern experimental toxicology is that they would all be wrong, and the Good Samaritan, whose external use of alcohol is mentioned, but to whom the Inventor of the parable, though desirous of describing his deed as skilful and

generous, did not attribute its internal administration, was right.

At the present time the surgeon finds in alcohol, under certain conditions, a most valuable antiseptic agent. The conditions, however, are worth noting. The substance is a protoplasmic poison, as indeed most antiseptics are. When it is applied to a wound, therefore, the fact that it is injurious to microbes is always complicated by the further fact that it is also injurious to the tissue cells of the part, upon whose vitality the patient depends for healing. Thus in no circumstances is alcohol now poured into an aseptic wound. On the other hand, the use of an alcoholic soap to remove the outer infected layers of the skin—as, for instance, the skin of a surgeon's hands prior to operation—is very valuable; and the same soap may be applied to the unbroken skin of the patient before any operation. The alcohol is here used as a valuable cleansing and antiseptic agent, without, however, reaching the living cells of deeper layers, which it would of course injure. Further, the antiseptic and cleansing properties of alcohol may be employed in the preservation and protection of various instruments which the surgeon has occasion to employ. Everyone is familiar with various forms in which alcohol exercises its property of a cleanser, but modern investigation has greatly enhanced our appreciation of its cleansing properties by showing that it is a powerful antiseptic.

It may be remarked in passing that surgeons and bacteriologists have not yet interested themselves to any appreciable extent in the vastly interesting question, Why are antiseptics antiseptics?

Microbes are perhaps the very simplest forms of life now extant. To study the conditions under

which they are killed is, by no means indirectly, to study the conditions under which life at its simplest may be maintained. The ultimate solution of the problem of life will be reached through physico-chemical inquiry along the lines already roughly sketched out by one or two contemporary students. In the particular case of alcohol, it seems clear that its antiseptic property in concentrated solutions, which exercise an actually and immediately lethal action upon microbes, depends primarily upon the fact that it has the power of coagulating or rendering solid some, at any rate, of the albumins or proteins which occur in fluid, and therefore labile, form in all living cells.

But this fatal coagulation of albumin only follows from the application of alcohol in concentrated form. In weaker solutions alcohol retards or destroys the life of microbes or of living cells generally, probably by an action which is well illustrated when alcohol is taken into our blood. The processes of oxidation or combustion upon which all life depends are retarded. As this action concerns not only " germs " but germ-cells, as I suspect, it may be carefully considered here.

In the influence of alcohol as a coagulator of albumin we have the crude or " contact " action of the drug. It depends upon a high degree of concentration, and is thus conspicuously inapplicable to, for instance, the case of septic dyspepsia. The patient may take alcohol in such cases—he usually does, and they are usually its consequence—but he does not disinfect the gastric contents, for the alcohol, taken even in the extremest concentration which the mouth will tolerate, is at once diluted by the gastric contents. Further, even if the stomach were empty the alcohol would speedily be diluted,

for this substance has an intense physico-chemical affinity for water, which it will draw to itself from any available quarter. This action is so rapid and powerful that alcohol cannot be used as a local caustic—it does not kill outright the cells of any tissue to which it may be applied.

Of far more significance is the fact that alcohol has an inhibitory or arrestive action upon ferments. As we have already seen, the activities of microbes are effected through the ferments which they produce. If these ferments or toxins be interfered with, the injurious action will be arrested. But more: all vital processes are dependent, we now believe, upon fermentation. This is true of all living cells, whether "germs" or germ-cells. Here, it may be suggested, is the outline of a key to the behaviour of alcohol when germ-cells are exposed to its action, as it circulates in the blood of a future parent. The factors in the germ-cell are really ferments, or the antecedents of ferments, and to expose them to alcohol, we may imagine as a suggestive hypothesis, is evidently to threaten the development of the future individual. The fact is proved: and this may suggest the interpretation.

A digression which refers to so important a parallel may possibly be pardoned. At least it will suffice to show that the relations of alcohol to vital processes are very much more than those of its "contact" action. It is probable that in any dilution whatever it retards the processes of fermentation and is accordingly negligible nowhere. Its well-known action in preventing the blood from giving up its oxygen, which has been customarily described as "increasing the stability of the oxy-hæmoglobin of the blood," really depends, no doubt, upon this

interference with the processes of fermentation which are involved in the decomposition of oxyhæmoglobin. The consideration of these matters will help us to understand what is of practical importance and interest—the internal action of alcohol in relation to the vital processes of repair and defence against the attacks of microbes, which are at the foundation of all surgery. Here is a question which concerns the surgeon and all his patients, actual or possible, and, as we shall see, it is like not a few others —as that of the relation between the earth and the sun—in that the present returns an answer directly contrary to that of the past because it depends upon a deeper analysis than any formerly possible.

But before we discuss this reversal of opinion we may begin with an earlier consideration from the surgeon's point of view. In so far as he is an operator, his first concern must necessarily be the character of his patient as a subject for the administration of an anæsthetic. Strictly speaking, we may now say that this is a question less for the surgeon than for the anæsthetist, who is now, as he ought to be, a responsible specialist, with theory, technique and experience of his own. Yet of course the operator himself is concerned, though in some measure his responsibility is now shared with the anæsthetist. As regards alcohol the verdict here is undisputed, and will so remain until, perhaps, Prof. Karl Pearson takes up the subject on the lines of his celebrated Memoir on Alcoholism and Offspring, in which he forgot to observe whether the alcohol or the offspring came first in the cases under his study. If we avoid this most fundamental of all fallacies, and observe the influence of alcoholism upon anæsthesia, in cases where the alcoholism comes first and

the anæsthesia second, we find that the patient is on the average gravely disadvantaged in almost every detail of the administration. The alcoholic subject takes the anæsthetic in its earliest stages very badly, commonly with much violence and delay, wasting his strength and requiring, in the upshot, a larger dose of the anæsthetic, which is of course a poison, and of which the less he needs the better for him. When he is "under," the alcoholic subject gives undue anxiety to the anæsthetist from beginning to end. It is far more difficult to maintain him continuously at that particular level of anæsthesia which is both safe and effective. At one moment he stops or threatens to stop breathing, and almost at the next he is semi-conscious. These facts are known to every anæsthetist and every surgeon. I have no first-hand knowledge of the influence of modern methods in overcoming the initial difficulty. It may be that getting the alcoholic patient "under" is a simple and safe proceeding nowadays, when the anæsthetic is given after the fashion described in the last chapter. But in Edinburgh ten years ago, when chloroform was given by the open method to patients recruited from classes whose habits are what they are in Scotland, one saw, almost daily, scenes which will not readily be forgotten as part of that indictment against alcohol to which every year lends additional force in my mind.

If, however, we consider the chemistry of alcohol, and recall its close alliance with other anæsthetics, such as ether (one being the hydrate and the other the oxide of the same base, and their names being ethyl alcohol and ethyl ether respectively), we shall understand how the problem of administering an anæsthetic must be complicated in persons who habitually

subject their nervous systems to the action of a very similar substance. Alcohol, ether and chloroform all have the same solvent action upon the lipoids of the body, this being the key to their narcotic and anæsthetic properties. Further, the central problem in anæsthesia is the maintenance of the respiration. The pulse must be continuously felt or watched, but the breathing always tends to stop first, and only when it fails, but most urgently then, is danger at hand. But the breathing depends upon the activity of the breathing centre, or "punctum vitale," in the bulbar portion of the brain; and the reason why the breathing of the alcoholic patient is commonly so unsatisfactory is that the cells of his nervous centres have been injured by their chronic intoxication. Death due to acute alcoholism or "drunkenness" or "intoxication" in the ordinary sense of the word is due, when it occurs, to alcoholic paralysis of the respiratory centre: the same cause as that of death from chloroform or ether or morphia. Indeed, this is the general rule with the narcotic poisons.

The practical moral for the individual reader is that, if ever he proposes to undergo a surgical operation, he would do well to prepare for the anæsthetic now by abstinence from alcohol. There are some hundreds of other reasons for the same proceeding, but they are not relevant here.

But assuming that the operation has been performed, and that the patient, alcoholic or not, has survived the administration of the anæsthetic—as all patients but perhaps one in nine or ten thousand may be expected to do nowadays, the chronic alcoholic class apart—we now have to consider the advisability of using alcohol to aid him in the process of repair, or in his fight against microbes, or in relief

of any surgical shock from which he may be suffering. The consideration of these questions may be prefaced by recent quotations from three of the most distinguished of living surgeons—Professor Theodor Kocher of Berne, whose instruments and original operative procedures are employed by surgeons everywhere, Sir Victor Horsley, who is perhaps Kocher's nearest rival amongst living surgeons, after the father of them all, and Sir Alfred Pearce Gould, now Senior Surgeon to the Middlesex Hospital. These names are much more than authoritative in the ordinary sense, and they are specially chosen from amongst any available number, because they abundantly suffice between them to prove my point as to the best contemporary surgical practice. I do not quote Sir Frederick Treves, since he has retired from practice.

Spoken at the Medical Temperance Breakfast, July 28, 1910, at the Imperial Institute, in London, Professor Kocher's words were as follow :—

> "You will be astonished to hear that I am a great friend of alcohol, though I know from experience that when I have to do much work, and good work, I must not drink alcohol at all. . . . So I am aware, and appreciate to the highest degree all that temperance societies have done for the welfare of humanity. But let me hurry to say that I differ very strongly in regard to what they are fighting against in the method of the application of alcohol. We use alcohol outside the body—to wash our hands, to disinfect us, to make us clean in every way—but we are afraid to introduce it into the body, and I only wish that your fighting against the people who use alcohol in the other way may

have the greatest success to make them understand that the only rational use of alcohol is outside the body."

Sir A. Pearce Gould spoke as follows on the same occasion :—

"For thirty years and more I have practically growingly abjured the use of alcohol in my practice. I began by trying to note what was the influence of alcohol in what we used to call in earlier days septic cases—erysipelas, pyæmia, etc., which, as you know, were always treated with liberal doses. I commenced by abruptly leaving off those liberal doses, and I remember when I knocked off brandy from a case of erysipelas the other hospital authorities began to have grave doubts about my sanity ; but the patient got well. For many years since then I have never given a drop of alcohol to any case of so-called septic infection, and anyone looking squarely on the protoplasmic effects of alcohol would not resort to its use in such a case. And gradually case after case, disease after disease, has fallen away, so far as I have had anything to do with it, from the administration of alcohol."

Lastly, from "Alcohol and the Human Body" (Fourth Edition, 1911), by Sir Victor Horsley and Dr. Mary Sturge, may be quoted the following, under the heading, "Disuse of Alcohol in Surgery" :—

"The only surgical condition in which alcohol is still thought by some to be of use is 'shock,' and even in this respect it is now giving place to other and more scientifically administered measures. Some of the present-day rapid recoveries are

also due to the fact that after operation the patients are no longer dosed with alcohol under the mistaken idea that it hastens recovery, and possibly also to the fact that they are increasingly encouraged to abstain from alcohol before the surgeon operates. Consequently, apart from the greater question of antiseptic improvements, the processes of repair and of healing proceed more quickly than in former times. The change is of course obvious, in both the medical and surgical aspects of treatment" (p. 6).

And also, under the heading, "The Healing of Wounds delayed by Alcohol" :—

"In the case of accidents or operations all surgeons know only too well the advantages of having to deal with patients who are habitual abstainers, on account of the better healing of their wounds. The reason is obvious: the protoplasm of their tissues is not degenerated, and it has a capacity for growth whereby the desired union of the edges of the wound is effected.

"Further, Kreparsky has shown that alcoholism, acute or chronic, lessens the number of white cells, and that the repair of wounds takes place more slowly in drinkers, because of the insufficient supply of white blood-corpuscles at the area undergoing healing.

"Numbers of patients accustomed to taking alcohol are indeed obliged to make a protracted stay in hospital on account of the slow healing of wounds which, had their tissues been in a normal condition, would have united rapidly. Many others are warned by surgeons that their healing power is

likely to be bad unless they abstain from alcohol for some weeks or months before operation."

The reader may well be content with the foregoing opinions as to the matter of fact. But there remains the remarkably instructive series of studies which have given us the key to the interpretation of the facts. The diminution of the white blood-corpuscles, already referred to, is only part, though doubtless an important part, of this interpretation.

Here we turn for guidance to the world-famous work of Metchnikoff, who made the pioneer researches, and who, with his pupils and followers, has settled the question from the experimental side no less surely than the surgeons from the observational and clinical side. Metchnikoff, as the discoverer of the function of the white blood-corpuscles or phagocytes, was evidently bound to cultivate the magnificent field of inquiry which this discovery opened to him, by studying the influence of all manner of agents upon the behaviour of leucocytes or phagocytes : and the most carefully studied of these agents has been the most important, which is, of course, alcohol. The following was Metchnikoff's verdict so far back as 1906 : " Besides its deleterious influence on the nervous system and other important parts of our body, alcohol has a harmful action on the white blood-cells, the agents of natural defence against infective microbes." So far as the observed action of alcohol upon the activity of leucocytes is concerned, we cannot do better than refer once again to Horsley and Sturge's admirable work. They say :—

" It is now proved that alcohol, even in tiny doses, paralyses more or less the white cells, which

thus cease from exercising their microbe-destroying function. Speaking in popular language, alcohol renders the white blood-cells less alert, so that they remain passive and motionless in the presence of dangerous microbes, which it is their duty to promptly destroy. Two Belgian observers, Massart and Bordet, in carrying out experiments on the attraction and repulsion of the living leucocytes by various bodies, found that alcohol, even in very dilute solution, strongly repelled leucocytes. Consequently, if alcohol even in very minute quantities is circulating in the blood, the leucocytes will not be able to make their way quickly into the blood, from the places of their manufacture, and thus be carried rapidly to any place where they are urgently needed. In consequence of this delay a severe illness frequently ensues: indeed, in the case of some microbes, these obtain such a strong foothold that the leucocytes never are able to drive them out. As Abbott has shown, this is particularly true of the microbe that causes erysipelas and cellulitis. The proneness of brewers and their draymen to suffer from these diseases is well known.

"The seriousness of this adverse influence of alcohol upon the vigour and energy of the white blood-corpuscles cannot be over-estimated. Herein lies the explanation of many infections, many prolonged illnesses, much chronic ill-health, and many premature deaths."

To all this there is the evident reply that the behaviour of leucocytes in the presence of alcohol proves nothing for the actual case of disease, and is only relevant on an assumption—that the movement

of leucocytes *is* protective against disease. It is necessary, therefore, to put the matter to the test, and this has now been done by many observers, and for many infections, surgical and medical, to accept an obsolescent classification. The final proofs are independent of Metchnikoff's theory in its original form. That theory assumed that the leucocytes do all the work that they appear to do. But it is highly probable that other agents aid the leucocytes, if indeed the leucocytes can do anything without them. It may be that the failure or success, the inertia or activity, of the leucocytes depend essentially upon changes in the fluid composition of the blood; and if this be so we must study the relation of alcohol to the processes as they occur within the body. On this point, Horsley and Sturge write as follows :—

"The liquid portion of the living blood, the plasma, also has very definite powers in assisting to defend the body against invasion by disease and microbes, which when absorbed from the lungs or bowel into the circulation, find their injurious effect counteracted and themselves destroyed by the plasma if this is in a normal healthy state.

"Laitinen has investigated this question and found that the fluid constituents of human blood have, in the case of moderate drinkers, a lessened bactericidal (slaying of bacteria) power, as estimated hæmolytically.

"A special interest attaches to this elaborate and prolonged research, in that the microbe employed as the test was that causing typhoid fever. The test was applied to large numbers of persons, in order to obtain reliable averages. It was found

that when small amounts of human blood were brought in contact with these microbes, and the resisting and conquering power of each specimen of blood estimated separately, the blood from those human beings who were abstainers possessed a greater power of resisting the growth and development of the bacteria.

"These results confirm those that had already been established by Laitinen as occurring in animals. The substances which should exist in the blood to complete the reaction by which resistance is thus obtained are called 'complements.'"

Dr. Sims Woodhead, a leader among those who are doing the pioneer work in this subject, and Professor of Pathology in the University of Cambridge, says on this point that—

"Abbot and Bergey were the first to find that in alcoholic poisoning these complements are irregularly but distinctly reduced, and they maintain that this reduction accounts, first of all, for the impaired power of nutrition met with in alcoholised animals, on the ground that there are not sufficient complements to combine with the necessary nutrient proteid or albuminoid substances circulating in the blood. Moreover, the lack of these complements is of importance, from the fact that without them it appears to be impossible for any immunity to disease to be set up in an animal. They offer this as an explanation of the fact that in alcoholism impaired nutrition is first observed; and that this is accompanied or followed by an interference with the production of immunity."

Professor Laitinen's verdict in 1909 ran thus: "It seems clear, therefore, that alcohol, even in comparatively small doses, exercises a prejudicial effect on the protective mechanism of the human body": and Professor Welch, a leader amongst American pathologists, adds that "This lowered resistance is manifested both by increased liability to contract the disease and by the greater severity of the disease."

Observations have been made with the microbes of all the most important medical and surgical infections, including tuberculosis, syphilis, cholera, typhoid fever, pneumonia, hydrophobia, tetanus and anthrax. The action of alcohol is uniformly deleterious in these and all other cases in which the investigation has been made. There is not one of all these inquiries which has resulted in favour of alcohol as regards any pathogenic microbe.

Tuberculosis is the most deadly of all diseases, and in its surgical forms, which are numberless, comes constantly under the care of the surgeon. These cases often run for many years, and every factor which weighs against the patient's powers of resistance thus becomes of high practical importance. The surgeon cannot hope to remove all the tubercle bacilli in any but rare cases. The knife can only aid the patient mechanically in the task which must be performed by his tissues or not at all. In many of these cases now the surgeon hopes to effect a cure by non-surgical means: thus tuberculous glands in the neck, and tubercle in joints and bones, may undergo slow cure if the patient's tissues are equal to the task. But whether or not the knife be employed, it is these tissues upon which all depends.

Comparative statistical inquiry in France and elsewhere has shown that the districts in which most alcohol is consumed are those in which there is the highest incidence of tuberculosis. In Great Britain the incidence of tuberculosis upon those who are engaged in the alcoholic trade is far in excess of the average. Commenting upon this fact, Dr. Arthur Newsholme, our first authority upon the disease, and now Principal Medical Officer to the Local Government Board, writes as follows: "It has been shown that alcohol lowers the resistance to infection; in other words, it opens the door to infection; it prepares the soil on which the seed of infection grows. This is well known to be true not only for consumption but also for such diseases as pneumonia, typhoid fever, erysipelas, blood-poisoning, etc. A great French physician, Dr. Brouardel, has well stated the matter in the following words: 'Alcoholism is in effect the most powerful factor in the propagation of tuberculosis. The most vigorous man who becomes alcoholic is without resistance before it.'"

In order to render this part of the argument final in so far as scientific opinion can make it so, we may conclude it by quotation of the following resolution, passed by the International Congress on Tuberculosis, which met in Paris in 1905:—

> "That in view of the close connexion between alcoholism and tuberculosis, this Congress strongly emphasises the importance of combining the fight against tuberculosis with the struggle against alcoholism."

Precise experimental proof of this association has been obtained from the lower animals, where the

details and date of infection and the intensity of the alcoholic poisoning can be precisely observed; and it is one of the certainly established facts of science. Many decades may be necessary before we can interpret the fact in chemical terms, and there may and will be abundance of controversy thereupon: but the fact itself is established.

Our duty is plainly indicated by the above-quoted resolution of the International Congress on Tuberculosis. The fight against tuberculosis must be combined with the fight against alcoholism. The great agencies which are now at work, endeavouring to educate public opinion for the extermination of consumption and the other forms of tuberculosis, will do less than their duty so long as they decline to give to this question in their propaganda the importance which it possesses in the facts. But the lamentable truth has to be placed on record that when it is sought to bring these facts, or the parallel facts of parental alcoholism, to the notice of workers against consumption and of Eugenists respectively, they reply, "We are not a temperance society"—to which the only possible rejoinder is that they ought to be.

To turn to the question of our duty on a smaller scale, it may be pointed out that, just as in the case of consumptives, so also in the case of surgical tuberculosis in all its forms, where in every case the vital indication is to maintain and increase the resistance of the patient's tissues, these patients or their parents —for children are the chief victims—are being daily deceived with all manner of patent medicines, lung tonics, tonic wines and so forth, which are nothing else than masked alcohol, in strong solution, sold at outrageous prices. Everywhere a little inquiry will

discover anxious and devoted parents, scraping and toiling to save the wherewithal to buy these abominations for a child with hip-joint or spine disease: dosing the victim continuously with the one substance which science has most exhaustively proved to lower the resistance of the human or animal body to all forms of tuberculosis. Sir James Barr, of Manchester, has recently pointed out that alcohol is probably more fatal when administered in typhoid fever than in pneumonia—"the protracted nature of the disease allows this medicament more time to work mischief." How much more are these words true of a chronic disease like tuberculosis, where "this medicament" may be systematically administered for months or even years, if the patient takes so long to succumb to the variety of poisons to which he is exposed!

There is no good reason why the ubiquity of the Press, and the beauty of the country, each of them precious and irreplaceable things, should be made to serve the purpose of those who advertise these far worse than fraudulent preparations. In the United States of America public opinion has been to some extent aroused by the courageous efforts of a popular weekly journal. In Great Britain little or nothing has yet been done, though the aggravation of chronic disease by the alcohol which is their only active principle is the least of the evils which flow from public and professional apathy in this matter.

Though I write as one who has undergone a medical education and holds medical and surgical degrees, I do not practise, and so far am I from having any bias against proprietary preparations as such that, on the contrary, I think it the duty of one in my independent position to commend publicly any which

he believes to be of real value and free from danger, and I have faced much criticism in order to do so. At least the fact should add weight to my words, far too light for the facts as they are, when I protest against the callous composure with which those who know the facts permit these enemies of the people to batten upon lives and limbs. The open trade in alcohol is as dangerous and disastrous to those concerned in it and to its patrons as any trade ever yet was; but what is to be said of this trade in masked alcohol, almost wholly consumed by those whose infirmity, of one sort or another, most urgently contra-indicates the use of alcohol in any form whatever? I reiterate here the demand which I have been making on many platforms throughout this country for many years past, that, at the very least, if the legislature is to levy a tax on these things and give them the apparent sanction of an official stamp, it should insist that every bottle should bear a label stating its alcoholic content. Any capacity for indignation, other than party-political, is nowadays looked upon as so very "dowdy" and "Victorian," and arguing so little sense of humour, that one requires to curb oneself in dealing with such subjects as this: but the indignation for which the few are laughed at to-day will be as nothing to the general indignation of the many at no distant date when the facts are known, and the supineness of those who might have dealt with them, but did not, is revealed.

There is no real and radical remedy but education, and the legislative possibilities which depend upon it. That education is now being slowly achieved: not by our ancient seats of learning, which have long given up learning, nor by our public schools, but by the temperance party and the ill-paid, hard-worked

teachers in the nation's elementary schools, who are now giving lessons about alcohol to the future citizens of the nation. Slowly, also, the practice of the rank and file of the medical profession is altering in accordance with that of their leaders: and the medical students of the present day are beginning to be taught nearly as much about alcohol and its effects as is found in the Board of Education syllabus for use in public elementary schools.

The use of this substance has been totally abandoned in the medical and surgical practice of the most honoured and most successful practitioners of the day. The latest work in the production of immunity against such diseases as hydrophobia and anthrax has proved that the processes by which immunity can be induced in men and animals are arrested by the simultaneous administration of alcohol. As the whole trend of modern medicine and surgery is towards the artificial production of immunity by the use of vaccines, sera, antitoxins and so forth, we may be assured that alcohol, once examined by science, has been condemned beyond recall. It is in the belief that the people perish for lack of knowledge—knowledge which is already in the hands of the few, that so much space has been devoted to the matter here.

One other point may be referred to, as I have never dealt with it before, and am constantly being asked to satisfy correspondents and doubtful readers of previous books. I have called alcohol a poison, as do all the text-books of physiology, pharmacology, toxicology, pathology and medical jurisprudence that have been published for some decades past: but those readers who are not acquainted with such works, nor with the universal classification of alcohol

with chloroform and ether as narcotic poisons—which are indeed combined in the anæsthetic mixture called "A.C.E."—suppose that this calling alcohol a poison is a sort of fanatical freak, which has no scientific warrant, and is palpably denied by the experience of every day.

But the scientific warrant is unquestionable. Many years ago Sir Andrew Clark said: "Alcohol is a poison—so is strychnine; so is arsenic; so is opium. It ranks with these agents. Health is always in some way or other injured by it." That was the opinion of an acute clinical observer; but since his day it has been justified up to the hilt by laboratory experiments. I will only quote the verdict of the physiologist, Professor Fick, and then we may examine the apparent contradiction between these two quotations and the repeated experience of the moderate drinker. He says:—

> "It is a daily occurrence to find persons unaccustomed to the use of alcoholic liquors, after drinking a small glass of wine (3 oz.) complain of dizziness, etc., indicating a circulatory disturbance. During these few moments it is hardly possible that more than one-third of the teaspoonful and a half of alcohol contained in the three ounces of wine could be absorbed and find its way into the blood. The amount of alcohol in the blood is thus less than one half-volume in a thousand, as the total amount of blood in the body is equal to about five quarts: and yet this almost inappreciable amount of alcohol in the blood causes a very decided disturbance in the action of the nervous system. Hence, there is no reason for being in doubt as to the justice of calling this substance a poison."

The moderate drinker replies that in point of fact he habitually feels better for his glass, that it enables him to sit down to write, that it helps his digestion, that it secures sleep, and that he is definitely the worse in all these and many other respects when he forgoes the alleged "poison," which, he definitely knows, does him immediate good in these ways.

Be it observed that the same is true of many other substances. Sir Andrew Clark likened alcohol to opium—which, indeed, it conspicuously resembles in action—and no one will question that opium is a poison: but I have seen one of the greatest poets of the last generation killed in two or three days for lack of the opium to which he was accustomed. It was for him the incomparable drug, just as alcohol is for the alcoholic, or tobacco for the smoker. No one who remembers his first smoke questions that tobacco-smoke contains poisons; one does not need to have seen nicotine or pyridine injected into a dog to know that. Yet the smoker knows that his pipe helps him to eat and digest, to sleep, to keep his bowel in order, to play and to work—most notably to read and to write. The poison that was is now invaluable: this man's poison has become this man's meat. If the obvious facts are pointed out to the opium-eater or morphinomaniac, or to the smoker, he accepts them—indeed, he knew them without being told: but if we similarly call alcohol a poison that is fanaticism.

The truth is that these cases, like a host beside, illustrate a very common pathological fact, which consists in the establishment of a vicious circle. We talk of "habit" very loosely. Sometimes we mean an inherited instinct; sometimes we mean a true habit or secondary automatism, looking like an instinct,

yet really not innate but acquired; and sometimes, when we talk of a drug habit, we mean what is not a habit at all.

The case may be best illustrated from the facts of morphia, which have been worked out and are finely described by the great pharmacologist, Professor Binz of Bonn—whence came a greater B in days gone by. Binz shows how morphia is split up in the body, producing an oxidation product, called di-oxy-morphine, which causes acute symptoms of depression and cardiac failure, only to be relieved by the administration of the antidote, which is morphine. But the new dose produces more of the depressant—and so the vicious circle goes on. As I say, I have seen a great genius die because he was deprived of sufficient morphine to neutralise the di-oxy-morphine which was killing him.

The theory here put forward is that other poisons behave in the same way. The body seeks to destroy them by burning them up; it does so with alcohol as with morphia, and alcohol has champions who argue that it is therefore a food. The oxidation is unfortunately complicated in both cases, and secondary products are formed, which it requires a fresh dose of the original poison to neutralise. The same is true of nicotine, and indeed there is any number of oxidisable poisons which behave in the same way, though only one of them finds friends hardy enough to call it a food on that account. The symptoms of the smoker, which I myself, then unregenerate, experienced daily for thirteen years, and which have helped me to understand the parallel symptoms of the drinker, of which I have no experience, and his very natural delusion—are thus explained: and so is the amazing paradox that a

man who is dying of chronic morphinism may be saved by a dose of the drug which is killing him. Those who know the facts and are honest with themselves and others will therefore rightly continue to call opium, nicotine and alcohol poisons: and the public recognition of the existence of food-poisons, which the liver filters from our most innocent forms of diet, and of aerial poisons, which can be obtained from the air of an unventilated and inhabited room, will gradually involve the decadence of the idea that nothing is a poison except, say, an ounce of prussic acid in one dose.

This long chapter must now close. It would obviously have been unscientific to refer to surgery alone, for the demarcations between surgery and medicine, like those between physiology and pathology, are factitious, and to respect them is to cloud the truth. I hope enough may have been said to show why the best surgeons nowadays use no alcohol at all: science having definitely proved that *the balance of the action of this substance upon the living body in health or disease is always mortal.*

What is true of the modern surgeon is no less true of the modern obstetrician, for this poison is the chief of those to which I have given the name of racial poisons. Its employment in pregnancy injures the coming child. Its use in child-birth lowers maternal resistance to microbes, increases hæmorrhage, and favours the child's risk of suffocation, owing to its action upon the respiratory centre. In this life-giving act alcohol is the ally of Death to all concerned, for exactly the same reasons as those which condemn it in relation to the use of anæsthetics and the performance of an ordinary operation. The reader who has seen what I have seen, in that portion of hell called

the Canongate of Edinburgh, of the influence of alcohol upon the Surgeon Nature's great operation, will ask at the end of this chapter, "How can anyone write so feebly and lukewarmly about this most mortal abomination of our time?"

## CHAPTER XIII

### MISS FLORENCE NIGHTINGALE

It is a commonplace of sociology that even the most individual work of art is a social product. Similarly, it is true of the history of science that great achievements are built by many hands even though individuality be as necessary here as elsewhere; and if we review the causes which have created modern surgery, we find that one of the most remarkable women in history, and certainly one of the most valuable, played an indispensable part in its creation.

We may say generally that wherever wounds are, there the principles of Listerism apply. The wound may be made by a bullet or sword; it may be made by the surgeon's knife; it may be visible, as these commonly are, or invisible, as are the wounds of child-birth. From one lofty and secure point of view there can be no differences greater than those represented by the wounds involved in taking life, the wounds involved in creating life, and the wounds involved in the endeavour to save it. But they are all wounds; they must all heal if the patient is to live; and the laws of their healing are the same in all cases.

Now the healing of wounds is a more or less prolonged business. Time also is required if the skin is to be prepared for the making of a wound under ideal surgical conditions. Preparation for operations,

or for child-birth, which is Nature's great operation, and the after treatment of this and man's operations, require that the surgeon and the obstetrician shall be aided by the nurse. How essential and valuable are the services of the nurse we shall see in due course, but as it is an object of this book to state in the barest outline the history of present achievement, we must first survey the work of Miss Florence Nightingale, without whom, undoubtedly, modern surgery would not be what it is.

So soon as we recognise in her the creator of modern nursing, and so soon as we realise what modern nursing means for modern surgery, so soon must we perceive that her name deserves correlative honour with that of the great man who begat modern surgery. This is indeed a product of the two sexes, as all human products, rightly considered, are; since all human producers are. The achievement, as we now see, may be said to be the immediate product of Lister and Nightingale, and even those who have the folly to pronounce themselves partisans of either sex will do well to forbear if they are tempted to allot a higher degree of merit to either the indispensable man or the indispensable woman whom we here celebrate.

All our ideas of merit and credit are at the mercy, if we knew it, of the principle of causation. In judging our fellows we have to refer to their physical parents, whom they did not choose, and to their spiritual parents whom, in a sense, they may have chosen, but for whom they are not responsible. We have seen that Lord Lister's spiritual parent was Pasteur, and it is interesting to learn that Miss Nightingale also had hers. As Lord Lister's was a man so hers was a woman, and her name was Elizabeth Fry.

Both Pasteur and Mrs. Fry had spiritual ancestors, the great chemists and biologists on the one side, apostles of religion and philanthropy—above all, George Fox—on the other side. Thus, beginning in that generation we may not unfairly state the genealogy of modern surgery—including modern nursing, for the two are really one—as follows :—

Louis Pasteur — Elizabeth Fry
Joseph Lister — Florence Nightingale
Modern Surgery.

This genealogy may be criticised by many, but perhaps it will be remembered by many more, and even the critics may possibly begin to think in terms of it before they are quite aware. Two points may be made before we pass from it. The first is that on both sides we find ourselves referred to the Society of Friends or Quakers, which gave us the physical and in large measure the spiritual ancestry of Joseph Lister himself and, on the other side, produced Elizabeth Fry. The second point worth noting is that surgery means hand-work, and that the only reason why nursing, which so largely consists of hand-work, may not be included under the category of surgery, is that the word is really so much richer and more beautiful, containing the idea of nourishment and tending. So far as the words are concerned, the surgeon merely manipulates, the nurse sustains. This merely by way of comment for any who may suppose that the position and dignity of surgery are compromised in a chapter which endeavours rightly to appreciate the woman's contribution to this great achievement.

Let us turn now to the circumstances of her life.

Elizabeth Fry, who was born in 1780, seems very remote from the present day; yet after all she was born only forty years before Florence Nightingale, who died in 1910. Mrs. Fry died in 1845, when Florence Nightingale was twenty-five, and it seems clear that the great pioneer of prison reform was the directive or motor influence which, working upon Miss Nightingale's unique natural endowment, determined the after-history of her life. That after-history may briefly be summarised here. The young girl was a granddaughter of William Smith, the friend and supporter of Wilberforce; and thus we see a second humanitarian and philanthropic influence, of the kind much despised by "practical men," which produced salvation in the Crimea when the "practical men" were landed in the impasse which awaits all such. Always the moral influences become the most practical; always the faddist wins, always the crank makes history—the right faddist and the right crank, no doubt. But so far as the march of mankind is concerned your "practical man" is but the beast of burden, from first to last.

In her earliest womanhood Florence Nightingale visited the chief hospitals in Great Britain and on the Continent. We who write and read are incapable of realising what kind of things she saw. Heaven forfend that we should deny to our predecessors, three-quarters of a century ago, the possession of all the qualities of intention and assiduity which it is to be hoped we exemplify to-day; only they lacked knowledge. It is difference in knowledge upon which essentially depends the difference between one generation and another. There is no reason to suppose that the kind-hearted and the nurses and

the doctors of to-day differ naturally in any marked degree or direction from countless hosts of their predecessors. Merely these know what those did not. This is the lesson for the enemies of science; for the enemies of research, who spend their lives to-day in making it more difficult for the year 2000 to surpass our own as it surpasses the 'forties of the nineteenth century.

At any rate, Miss Nightingale saw what there was to see; which is not so easy as it sounds. She undertook in 1850 the care of a Home for Sick Governesses, and devoted herself also to the interests of ragged schools and similar institutions for which Elizabeth Fry had done so much. Then there came the Crimean War and the appalling accounts published in the columns of *The Times* by the late Dr. (afterwards Sir William Howard) Russell, who "showed how the commonest accessories of a hospital were wanting; how the sick appeared to be tended by the sick, and the dying by the dying; how, indeed, the manner in which the sick and wounded were being treated was worthy only of the savages of Dahomey; and how, while our own medical system was shamefully bad, that of the French was exceedingly good, and was, too, rendered still more efficient because of the Sisters of Charity, who had followed the French troops in incredible numbers." *

This passage is of special interest because it serves as an index in some manner of what Lord Lister and Miss Nightingale have achieved. The Sister of Charity as we find her at the present day on the continent of Europe doubtless has all the qualities

* This passage is quoted from *The Times* Obituary Notice of Miss Nightingale, August 15th, 1910, to which I am also indebted elsewhere in the course of this chapter.

which she had half a century ago. She usually has many personal qualities which are not to be found in every modern nurse. But so far as knowledge is concerned, she remains where she was, or almost where she was, at that time—which, so far as surgery and nursing are concerned, is antiquity, Homeric in its remoteness from the knowledge, the practice, and the achievements of to-day. "Efficient" is the last word that could be applied to the Sister of Charity from the physical and bacteriological standpoint to-day. The perfect nurse of the future will combine her psychological efficiency, as we may call it, with the scientific knowledge and practice of the modern nurse. It is hoped that the reader will pardon these interruptions to our story, but this one, at any rate, was inevitable.

It was in October 1854 that Miss Nightingale wrote to Mr. Sidney (afterwards Lord) Herbert, Secretary at War, offering to go to Scutari. Her letter was crossed by one to herself from Mr. Herbert, who perceived that "a number of sentimental and enthusiastic ladies turned loose in the hospital at Scutari would probably, after a few days, be *mises à la porte*, by those whose business they would interrupt and whose authority they would dispute." As everyone knows, Miss Nightingale went, and the great work was done; though this did not prevent "a number of sentimental and enthusiastic ladies" from being justly described as a plague of women by Sir Frederick Treves in South Africa half a century later. Here also is abundant room for comment, but at least let no one suppose that in order to be a Florence Nightingale it is simply necessary to possess sympathy and pity raised to their highest power Genius, such as we celebrate in this book, is a complex,

happily and with *justesse* composed of many constituents. A sufficiency of pity will no more make a Florence Nightingale than a sufficiency of dexterity will make a Lister.

Florence Nightingale not merely did her work in the Crimea—work done despite the enmity and criticism of religious sectaries and of officialism both at home and in the Crimea. The end of the war was really the beginning of that part of her work which endures and will endure; for there is no discharge in that war. Already, however, history and fame are taking their customary course. To the public at large Miss Nightingale is the "Lady with the Lamp"; the woman who was brave and pitiful enough to go to the Crimea to turn the pillow and moisten the lips of the dying. She is known by Longfellow's poem and by the efforts of painters, and is remembered in connection with the Crimea. But the true history of this matter is very different. If the Crimea was, as John Bright suggested, properly to be spelt "a crime," it were best quickly forgotten or remembered as an awful example: save only that it served the great function of starting Miss Nightingale upon the construction of modern nursing. In the ultimate verdict of history, when England and France and Russia and Turkey are little more than names for the antiquary, it may be that that war will have one title to general remembrance, in that it was the dominant circumstance wherein modern nursing was born.

The National Fund to Miss Nightingale was admirably devoted, at her wish, to the establishment of the Florence Nightingale Home for Nurses at St. Thomas's Hospital and to the maintenance and instruction of Midwifery Nurses at King's College

Hospital. It was a singular sequence that from war should be born the new epoch in the care of those who create the life of this world to come.

First of all, as might be expected, it was in military nursing that Miss Nightingale's knowledge and wisdom were first sought. Military nursing largely, though by no means wholly, means surgical nursing, and it is interesting to notice how close was the association in time between this work of Miss Nightingale's and the earlier scientific researches of Lord Lister. Fortunately for him and his work, Miss Nightingale, who was seven years his senior, and the Crimean War came first. The work of the late 'fifties and early 'sixties largely achieved those nursing conditions which were so necessary for the success of Lister's reform, and which Listerism in its turn made so much more necessary.

Military nursing was, of course, completely revolutionised by Florence Nightingale. Following up the personal services she had already rendered in the East in regard to Army nursing, she prepared, at the request of the War Office, an exhaustive and confidential report on the working of the Army Medical Department in the Crimea as the precursor to complete reorganisation at home; she was the means of inspiring more humane and more efficient treatment of the wounded both in the American Civil War and the Franco-German War; and it was the stirring record of her deeds that led to the founding of the Red Cross Society, now established in every civilised land. By the Indian Government also she was almost ceaselessly consulted on questions affecting the health of the Indian Army. On the outbreak of the Indian Mutiny she even offered to go out and organise a nursing staff for the troops in

India. The state of her health did not warrant the acceptance of this offer; but no one can doubt that, if campaigns are fought under more humane conditions to-day as regards the care of wounded soldiers, the result is very largely due to the example and also the counsels of Florence Nightingale.

As we have already seen, the nation which produced this wonderful woman and also Lord Lister, may have learnt its lesson from her but certainly has not learnt its lesson from him, so far as warfare is concerned. This, of course, is not the fault of the surgeons; it is the fault of the incurable, boastful, gratified, and lethal ignorance which fought Miss Nightingale in the Crimea half a century ago and which produced, quite lately, a Field-Marshal's remark that medical advice is a very good thing—when it is asked for.

The military aspects of Miss Nightingale's work are the popular ones and the least important. Wars play a great part in history books; they are not, however, the essentials but the incidents of the history of civilisation. One of the essentials of that history is the creating of the trained nurse, and that was Miss Nightingale's work. She perceived, from the first, that, as she said, "one of the chief uses of a hospital (though almost entirely neglected up to the present time) is this—to train nurses for nursing the sick at home." We have seen that the nation's offering to her was devoted to this purpose. Many years later Queen Victoria's Jubilee Institute for Nurses followed on the earlier results of Miss Nightingale's work, and to her also must be awarded the honour of having substituted the trained nurse for utter incompetence in the care of the sick pauper.

But above all, we must recognise the supreme service of this woman to the supreme function of womanhood.

He who thinks of Listerism only in its relation to war or only in its relation to surgical operations, ignoring what Pasteur and Lister have done for motherhood, is simply committing the ordinary but fatal error of placing things transient and secondary above the one thing essential. We must avoid this error when we study the work of Florence Nightingale. It was in 1871—just a year or two, as we may notice, after the introduction of carbolic acid by Lister—that Miss Nightingale published her "Introductory Notes on Lying-in Hospitals." Ten years later she referred to that little book, in a letter written to the lady who was seeking to found what is now the Midwives' Institute, in the following forcible and veritable terms :—

> "The main object of the Notes was (after dealing with the sanitary question) to point out the utter absence of any means of training in any existing institutions in Great Britain. Since the Notes were written, next to nothing has been done to remedy this defect. . . . The prospectus is most excellent. . . . I wish you success from the bottom of my heart if, as I cannot doubt, your wisdom and energy work out a scheme by which to supply the deadly want of training among women practising midwifery in England. (It is a farce and a mockery to call them midwives or even midwifery nurses, and no certificate now given makes them so.) France, Germany, and even Russia would consider it woman-slaughter to practise as we do."

Elsewhere we study, as adequately as may be, the facts which justified, and still too often justify, Miss Nightingale's words. There is plenty of woman slaughter to be recorded, still committed by doctors and nurses alike to whom the names of Lister and Nightingale are nothing, and who practise in all essentials the methods of barbarism. Modern obstetrics is a really new thing in the world; nothing more beneficent, nothing more fundamental for the continuance of mankind can be named. It dates definitely from the years hitherto celebrated in history—as it will not always be written—as those of the Franco-Prussian War. While that was going on Lord Lister was demonstrating the facts our knowledge of which enables us to protect the woman in child-birth, and Miss Nightingale was writing her "Introductory Notes." The modern obstetrician and obstetric nurse or midwife are the offspring of these two parents and their vital work in those mortal years.

Before we pass on to consider the nature, the meaning and the consequences of the revolution which Miss Nightingale achieved, let us, in leaving her life and personality, learn to perceive in her the supreme illustration of a principle to which this present commentator has often directed attention.

For me it is as clear as the sun at noon and as continuous as the ether through which he shines that womanhood always was and ever must be consecrated first and last to motherhood. But it is also clear that, though for the sub-human female there is no other motherhood than that which is physical and individual and concrete, for womanhood there are further possibilities. Human motherhood may be and is both physical and psychical. The human

mother bears and she tends, and a woman may tend though she does not actually bear. The conditions of human life and especially of human infancy are such that the tending is as important as the actual bearing, since we are born so helpless and so long helpless. Thus, though I hold that all women fail unless they achieve motherhood—or, if they succeed, succeed not as women but as neuters—and though no modern demonstrations of feminine capacity in whatever direction can dissuade from that opinion anyone who studies human life from the standpoint of the biologist, yet I hold no less earnestly that women may succeed and succeed abundantly in achieving a worthy and happy individual destiny, altogether apart from physical motherhood, by means of what we may call Foster-motherhood.

Whenever one urges, in public or in private, the proposition that woman is made for motherhood, it is replied, reasonably enough, that, in a country such as Great Britain, where there are one and a third millions of "superfluous women," this is to condemn a large proportion of the sex to failure under any monogamous form of marriage. The reply to this criticism is that human motherhood obviously has two aspects, which may be called respectively physical and psychical, and that the purely physical aspect of motherhood, which was once the whole of it, is amongst ourselves only a part, and in a sense a lesser part. Lesser it can never be from the racial point of view, since it is obviously indispensable; but it is indeed lesser from the individual point of view. Many a maiden aunt, for instance, has fulfilled her maternal destiny, and achieved the highest happiness and worthiest development of herself, by mothering

nephews and nieces, the lack of merely physical or organic motherhood notwithstanding. It is, therefore, convenient to speak of motherhood and foster-motherhood, and to declare, as one may, that these terms between them cover the whole duty, destiny, and happiness of all except evidently aberrant and quasi-neuter women. Foster-motherhood, as thus understood, will include, and will guide us to, all those functions of which the essential character is maternal, and therefore womanly. All forms of nursing, of course, come first in the category : infant nursing, military nursing, ordinary sick nursing, obstetric nursing, and midwifery ; and the whole training and education of infancy and young childhood must evidently be included. Whenever and wherever there is life to be tended, nourished or nursed (the words are variants of the same), educated, and saved, whether the life be yet unborn, or newborn, or senile, or ill, there is the field for womanhood exercising its great function of foster-motherhood. Historically, all these functions and possibilities are to be traced to the maternal instinct and its correlative tender emotion, aroused by the spectacle of helpless infancy, as Dr. McDougall has clearly shown in his remarkable work on "Social Psychology."

Need it be said that the supreme example of this principle, whose name and fame one has long been in the habit of employing to illustrate it, is Miss Florence Nightingale ? The "Lady with the Lamp" is to be honoured as the greatest foster-mother in history. What a lesson alike for those who see no *rôle* for unmarried womanhood, and for those who seek nowadays to deny and decry the distinctive attributes of womanhood in favour of those functions —humbler, as one thinks—which, really distinctive

of neither sex, are commonly called masculine! It seems to be imagined that Florence Nightingale is to be remembered because she once did something for soldiers in the Crimea. That was a great deed; but it was merely the beginning of her life's achievement. She is the greatest foster-mother in history because she is the creator of modern nursing, and because her "Introductory Notes on Lying-in Hospitals," published in 1871, led to the creation of the modern obstetric nurse and midwife, who save the lives of countless mothers and infants throughout the world every year.

Soldiers and mothers have only one friend who can be named beside this woman. Lord Lister, seven years Florence Nightingale's junior, introduced carbolic acid into surgery in 1868. He and she, each in the manner for which Nature or Providence fitted them, were simultaneously inaugurating the new era—he the foster-father, she the foster-mother of myriads of this generation, and unthinkable millions of those who are to be. His methods demanded the trained nurse, both for surgery and midwifery, both for the battlefield, where life is destroyed, and for the lying-in room, where it is made; and her work was to provide the training and the principles, the ideals and the enthusiasm, and the tiniest, humblest details too, whereby the modern nurse is made. These two are scarcely to be matched among the saviours and makers of life. Pasteur, indeed, is the spiritual father of Lister and many more; and Elizabeth Fry, as we have seen, was the spiritual mother of Florence Nightingale; but it is safely to be asserted that of all women hitherto, apart from the indirect influence upon mankind of the mothers of great religious founders, Florence

Nightingale is the foremost as a foster-mother indeed. When the Crimea and the combatants therein are but names for the antiquary, her creative breath will still ebb and flow anew in the life of this world to come.

## CHAPTER XIV

### THE MODERN NURSE

The modern nurse, at once a product and a condition of Listerism, is a really new product of our civilisation. She discharges the oldest and most characteristic of womanly functions, but she does so in a new way. The difference, of course, is constituted by knowledge, and it is so great that the modern nurse, taking an ordinary surgical case, must be reckoned far superior as a surgeon to Paré or Hunter. She knows and she practises the first principles of healing, which were unknown to those great masters. But before we study more carefully the qualifications and the value of the nurse in modern surgery, we may observe two opposite errors into which many fall regarding the conditions under which the good nurse is to be found.

There is first the error of supposing that the good nurse can be made at all. It is of course not so, and the error leads and will lead to disappointment. The good nurse of either sex is a product of both nature and nurture. He or she is born and made also. Until the modern era, the nature of the nurse, we may say, was everything and the nurture almost nothing. The utmost that a nurse could possess was certain natural qualifications. To-day we are apt to suppose, remembering the technical knowledge peculiar to our time, that these natural quali-

fications are of no importance or that they can be replaced by training.

We must learn therefore that many are called but not all are chosen. The natural qualifications for the making of the satisfactory nurse are fortunately by no means uncommon. I will not wait to argue whether they are more common in either sex; suffice it that many women possess them in considerable degree. Sympathy, patience, tact, courage, resolution and faithfulness are amongst the qualifications demanded. Only the rudest imitations of them can be implanted by training, and the nurse who does not possess them will fail those who depend upon her no less certainly than if she had not been trained at all. These are remarks of course which apply equally to the doctor, the clergyman, or anyone else whose business involves intimate and vital relations of a personal kind with his fellows. They do not mean that training is less necessary for the nurse than for these, nor that it is to be condemned as unsatisfactory because its introduction fails the expectations of those who supposed that here, though certainly nowhere else, training can do everything.

The theoretical moral is obvious; it ratifies the Eugenist who declares that education, training, nurture are only secondary in the making of human beings. The practical moral is no less obvious. It is that the public must not be misled into supposing that the possession of a certificate suffices for the nurse it needs in its hour of crisis. It will be shown in a moment that only the grossest folly will seek for a nurse nowadays who has not been genuinely trained. But, on the other hand, if we are wise we shall seek for evidence in making our choice such as no certi-

ficates can furnish. It is of course the same with the choice of a doctor. Wise people do not dream of consulting a *soi-disant* doctor who has no evidence of training, but on the other hand they do not suppose that the evidence of training suffices. They search for testimony of another kind. Now in choosing a nurse the public cannot really do better than choose its doctor rightly, and then accept the nurse he chooses. The right kind of doctor will employ the right kind of nurse. She will, of course, be trained, but she will also be predestined, and the doctor, because he is also trained and predestined, will have chosen her accordingly. Once found, this right kind of nurse is amongst the most valuable of the friends of the family. The longer she and the family have known each other the more valuable will she be. You cannot treat her too well nor value her too highly.

When she first comes to you, and you know nothing of her ways nor she of yours, you must remember that she has the highest credentials because the doctor whom you trust has chosen her, and you must not be too ready to disapprove. Remember also that however nice you may be, she does not always have to deal with nice people by any means. There is every likelihood of her being imposed upon and her value underrated. She probably, therefore, pitches her claims high, and you may feel rather inclined to resent them. Here is your opportunity for a little patience. Remember that her duty is to her patient and to the doctor for the patient; not in the least to her patient's friends, even though these may pay her. She is in the somewhat peculiar relation, therefore, of not having to please or satisfy her employers, and they must remember this. Assuming

you to be the patient's sister, shall we say, it does not in the least matter whether you like her but whether the patient likes her. Further, the mere fact that she has begun to take charge of the case is a substantial argument from the patient's point of view against premature dissatisfaction with her. At present there is no doubt that the nurse is in a somewhat anomalous position. Her *status* is ill-defined. Apart from her professional *status* she herself may be of widely variable social antecedents, and the public has not yet learnt whether to regard her as an ally, if not almost an equal, of the doctor—or, on the other hand, as a domestic servant who gives herself airs. Now the plain truth is that the modern nurse belongs to the former category and not the latter. She is very likely the equal of her employer in social antecedents; she is almost certainly the superior of her employer in knowledge, in self-control, and in her value to society. Choose her well, then treat her well, and in the hours or days upon which all hangs, she will not fail you.

We have wandered somewhat perhaps from the discussion of our first error, which was that the natural and irreplaceable qualifications for nursing can safely be ignored in these days. Let us turn now to its counterpart, which is the error of supposing that training is superfluous. People are still to be found who think that a nurse's duties are partly menial and partly angelic—making the bed and smoothing the midnight pillow. Such people grudge the fees which the modern nurse demands and earns. More serious still, they suppose that their opinion is worthy to rank with hers, and in the absence of the doctor and his orders they may hamper the nurse most seriously in the performance of her

duties. Here, then, is an error which requires to be animadverted upon. Modern nursing requires training, for many important and critical duties which are intermediate between making the bed, on the one hand, and smoothing the midnight pillow, on the other hand. The training for these duties is necessarily long and expensive, and money is never spent to better profit than in paying the very moderate fees which a good nurse earns many times over. The attempt to save money by doing without a nurse when the doctor wants one or by employing an untrained person is likely to be disastrous. It is often argued by devoted friends that loving hands ought to do the work of nursing apart altogether from the question of money. They hate the idea of delegating this intimate and important work to an outsider; nor do they care to be treated as intruders in the sick-room, nor to have to obey the orders of one whom they regard as an underling. One cannot but sympathise with such feelings, but they must be qualified by completer knowledge of the nurse's functions and qualifications. In the light of that knowledge we shall realise that loving hands, which we have not been trained to clean on surgical principles, may work irremediable harm, where hands less loving but trained and dutiful will do nothing but good. We shall learn also that the nurse's knowledge and training are such as entirely to supersede our amateur theories and the scraps of information, blended with superstition, which we have derived partly from hearsay, partly from ancestral practice, partly from the most up-to-date contributions of medical correspondents of the daily press. We commonly do not realise in the least what a strange jumble our medical knowledge

consists of—perhaps a rich blend of some mediæval delusion about, shall we say, "keeping the air away from the wound," with some modern theory of immunity which is removed by fifty stages of increasing knowledge from that ancient delusion. Add the circumstance that our judgment is vitiated by a blend of emotions, sympathy and fear for the loved patient, distrust for the stranger, chagrin at our own supersession—and surely it will be seen that our views and proposals are likely to do nothing but harm if pitted against those of the nurse. In short, we must learn that we have engaged an expert and must trust her.

I well know that this is easier said than done. The commentator who is a doctor himself is usually unable to realise the feelings of a patient's friends because even when his own folk are ill he is at any rate one of the consultants. But on one occasion, at any rate, the present writer was debarred from visiting a patient for whom he had much concern, and in twenty-four hours he had experienced at first-hand all those emotions which we are now discussing. He distrusted the doctor whom he had himself chosen; he took a dislike to the excellent Nursing Home in which the patient lay; at every stage he wanted to intervene, and felt dissatisfied with all the news vouchsafed him from the sick-room, just as other people do. Perhaps this experience may add to the value of what is now being written.

At any rate, let us convince ourselves that the modern nurse is really an expert, and that she is engaged in a business which requires an expert. The truth is that if one were to choose in any ordinary case, medical or surgical, between the sole attentions

of an average doctor of half a century ago or an average nurse of to-day, there would be simply no question as to our wisest course. The nurse would be worth fifty of the doctor, alike in principles and in details. The modern nurse has entered into the heritage of modern medical and surgical practice. The doctor of half a century ago did not know the cause of inflammation; the modern nurse does. That one fact alone establishes an abyss between them. He was in the dark ages, she in the light of to-day; he did things incessantly and as a matter of course which in her eyes would be simply criminal. He walked along the hospital ward and used one and the same sponge for all the patients, carrying death and no less, in his hands; and she has learnt to do otherwise. Doubtless she knows less than the modern doctor, doubtless she must obey him, but in the absence of him and his orders her presence in the house means the presence of skill and knowledge, vastly superior, on the whole, to any skill and knowledge whatever which were obtainable upon the earth less than two generations ago. There were giants indeed in those days and in the days before them. There may be scarcely any men or women to rival some who were living then, and yet it is asserted that the first nurse whom you choose almost at random by telephone brings with her knowledge and capacity of a vital order which John Hunter had not nor Astley Cooper nor James Simpson.

It seems absurd, but it is true. Where, indeed, would progress be, as we understand it, if such assertions could not be true? This is the meaning of the social heritage. There are fundamentals of physics and astronomy, of chemistry and biology, which are familiarly known not merely to the ideal

schoolboy of Macaulay but to everyone nowadays, yet which were utterly hidden from Aristotle and Bacon. We stand on our ancestors' shoulders, and consequently see further. This is as true of medicine as it is of any other science. Yet here popular knowledge lags conspicuously far behind that of the expert. We all know more about the relations of earth and sun than Aristotle or Bacon did, but so far as the causes of inflammation are concerned popular opinion is no better informed to-day than ever in the past. The modern nurse, however, has entered into this part of the social heritage as the public at large has not, and until the elementary facts of the medical sciences are taught as the elementary facts of other sciences should be, the modern nurse in an average house is the twentieth century come to the rescue of the tenth.

Those who know the real importance and dignity of this great modern profession, and the extent to which the realisation of the practical value of medical and surgical knowledge depends upon the nurse, are bound to concern themselves in every possible way with raising the *status* and the qualifications of her who fulfils such a great function for the modern state. It need scarcely be said that the first and plainest of indications is the establishment of some means whereby the qualified nurse may be distinguished from the unqualified. It has not yet been possible to get public opinion to assent to legislation prohibiting medical practice on the part of unqualified persons, and it would be absurd to ask for any such prohibition in the case of unqualified nurses; at any rate so far as ordinary sick-nursing is concerned. But it is certainly reasonable that the nurse who has faithfully qualified herself for her task at the

expenditure of much time and money and labour should be distinguishable from the first person who chooses to don a nurse's uniform, though her medical knowledge be simply the medical ignorance of the general public. I certainly plead here, therefore, for the State Registration of trained nurses. We began this chapter by admitting that the nurse is born as well as made, and that no kind of hall-mark certifying to the making process can guarantee the first condition. That, however, is no reason whatever for questioning the rightness of training and of identifying the trained.

If the foregoing applies, as it does, to nursing in general, there is one department of nursing to which it applies a thousandfold, since therein the difference between knowledge and ignorance constantly proves itself to be the difference between life and death. I refer, of course, to obstetric nursing. We may briefly remind ourselves that child-birth is normally a physiological process requiring very little assistance, but that it always involves pathological risks, and that these are incalculably multiplied if the mother be assisted without knowledge. It is no doubt ideally desirable that every mother should be tended by a doctor of one sex or other. It would be absurd to assert, however, that that is necessary in the great majority of cases. Nevertheless there is a minimum demand which, in the interests of motherhood—and therefore of everything else—may be formulated and must some day be complied with. It is that every mother should be attended at child-birth by someone conversant with Listerism. The obstetric nurse or the midwife—it really matters but little by which name we call her—will doubtless be none the worse for knowing something of obstetrical

diagnosis, especially as the responsibility will rest with her of sending for a doctor should occasion arise. In the not distant future every woman in her critical hour will be so attended. Meanwhile, I make a lesser yet all-important demand. It is simply that the attendant, whether her obstetric knowledge be great or small, must be a practising Listerian. If she be not this, no other qualifications can compensate for the lack of this vital need. It has to be admitted, therefore, that according to this demand of ours, a vast host not merely of midwives, qualified or unqualified, but of actually registered and practising doctors, would be dismissed from all further opportunities of obstetric practice. The bare record of the number of mothers whose lives are lost in England and Wales alone every year because someone has infected them in defiance of Listerian principles, would suffice to show that this demand of ours is very far from being complied with, and that compliance with it would mean the saving of thousands of mothers' lives in this country alone every year.

None of these deaths should occur. They are essentially homicidal. The most precious part of the community, in the performance of its supreme task, is destroyed in thousands of instances yearly because knowledge which is now more than a generation old is defied by the ignorant or careless. The time will come when every fatal case of what is called puerperal fever will be the subject of an official inquiry, and sooner still the time will come when, whatever may be permitted as regards unqualified medical practice in general, none but the qualified will be allowed to attend upon child-birth. For Great Britain the recent Midwives' Act has gone far in this direction.

Here is another instance of the manner in which moralists of many schools permit themselves to descant vainly in one direction when their help is needed in another. There is no mark at which the moralist more commonly aims nowadays than the fall in the birth-rate. It falls and continues to fall in spite of him, and I doubt whether all his railings have yet aided a single unit to the population. Yet if he were wise he would direct his attention to the scandalous conditions of the existing birth-rate; to the neglect and maltreatment of motherhood and infancy. We who have undertaken this task have already added to the population scores of thousands of infants who would otherwise have died. This is not raising the birth-rate nor arresting its decline, but it is furthering the end for which birth occurs. Let these moralists turn from a phenomenon which they cannot affect and devote themselves to the practicable aspect of the same subject—to the safeguarding and ennobling of motherhood and infancy. This is a great task with many factors, but one of them assuredly is the provision of Listerian obstetrics for every mother in the land.

We must encourage women of the best type to enter this great profession of obstetric nursing; we must realise that this is worth our while from the national point of view, and that the labourer is worthy of her hire. She must be available to every mother. Obstetric complications and accidents will occur, no doubt, in some degree to the end of time, but puerperal infection must end in the homes of the poor, as it has ended already in the homes of the well-to-do and in Maternity Hospitals. It might once have been argued that the infection cannot be avoided in the homes of the poor because of the

sanitary conditions which there prevail. But not so long ago it was in the Maternity Hospitals that the infection could not be avoided. The truth is that not the sanitary conditions in general but the immediately local conditions determine the occurrence or prevention of infection. There is no more need for puerperal fever to occur in any one place than in any other. The crucial factor is the personal attendant of the lying-in mother, or especially may we say the hands of that special attendant. The same—but greater—importance attaches to them as to the hands of the operating surgeon and for precisely the same reason. The very same species of microbes, indeed, which are to be feared in the one case are to be feared in the other. Now the hands of the surgeon or of the obstetric nurse may be infected according to what has been done with them, either in a Maternity Hospital or in a palace or in a hovel, and they can be efficiently disinfected in any of these places. Everywhere the essential is responsible knowledge—knowledge which is now obtainable, and the practical application of which is not expensive.

The present incidence of puerperal fever in the land of Lister is a great scandal. We are fully entitled to assert that there should be no such thing. Doctors and nurses who practise their profession as they should go through their entire careers without having a single case ; others carry death in their hands wherever they go. They should be put a stop to. It must be remembered that not merely the death of thousands of mothers is to be reckoned as the consequence of failure to apply Listerism to obstetrics. Very often the loss of the mother means the loss of the child, since infant mortality is so

much higher amongst infants who are not nursed at the breast. Further, the destruction of so many women at the child-bearing ages necessarily lowers the birth-rate, Thus if our moralists desired to raise the birth-rate as it should be raised, they would set themselves to protect mothers from such conditions as these which destroy them, and their efforts thus directed would certainly be rewarded.

Yet further be it noted that the most common of all the exciting causes of insanity, according to the official records in Great Britain, is the puerperal state. The shock and strain incident upon child-birth disorganise for a greater or longer period the mental functions of a large number of mothers. It need scarcely be said that, as we should expect, puerperal infection, failing actually to kill the patient, very often suffices to produce insanity. The shock and strain of normal child-birth are relatively slight as factors of mental disorganisation when compared with the same conditions supplemented by the absorption into the blood and nervous tissues of poisons derived from the microbic infection which constitutes puerperal fever.

It will thus be seen that the application of Listerism to obstetrics by means of the obstetric nurse or mid-wife will involve in proportion to its completeness the substantial abolition of deaths due to child-birth, the overwhelming majority of which are consequences of puerperal fever, which under Listerism cannot occur ; a reduction of infant mortality ; a rise in the birth-rate, other things being equal ; and a reduction in the incidence of puerperal insanity.

It will be seen, therefore, that the obstetric nurse stands at the very foundations of national well-

being. Her services save mothers in life and in mind; they save infants; and they increase the production of infants. As the birth-rate persistently declines, the national importance of births will steadily become more evident. Attention will more and more be directed to the saving of the babies that *are* born and of those who produce them. Listerism will be as triumphantly applied to the saving of life in the lying-in room as upon the battle-field; and obstetric nursing, which is indeed the highest branch of the art, will receive the honour which is its due.

To this chapter a few supplementary words may be added regarding a special function of the obstetric nurse which Listerism has taught her to discharge. Far and away the commonest cause of blindness from birth is inflammation of the eyes, due to their invasion when the child first opens them at its birth by a certain minute organism called the gonococcus. This produces an intense inflammation of much the same order as that for which many other kinds of coccus are responsible. It is transient but its effects are permanent, for it involves the cornea or transparent portion of the front of the eye, and in the course of the healing the cornea becomes irremediably opaque. Listerism has indeed made it possible for one recorded eye, at any rate, to have a transparent piece of cornea substituted by grafting for the cornea which inflammation had ruined. Apart from that case, all eyes thus destroyed are destroyed for ever. Now we know for certain that this appalling disaster, with its horrible cruelty to large numbers of infants all the world over, and with its lasting consequences, is completely preventable if the ordinary principles

of Listerism be applied to the baby's eyes directly it is born. Every modern obstetric nurse regards this as an essential part of her duties. Within a few seconds or a minute or two at latest of the child's birth, its eyes are scrupulously swabbed out with an antiseptic lotion, and any infection which may have entered them is thus washed away. It would be hard to find an instance where a simpler and easier precaution averts more disaster than this. It follows that there are many thousands of seeing persons walking about unaided in any modern community who, but for Listerism, would be blind. Very few, indeed, we must understand, of those who are asserted to have been born blind were born other than normal as regards their eyes. The eyes were infected during their birth; in most cases at the very instant when they were first opened to the light. But here in our day Lord Lister intervenes, and the eyes are saved. I suggest that contributors to Blind Asylums and those who give their pennies to blind people in the streets should consider the propriety of devoting their sympathy and their means primarily to the provision of good Listerian nursing for all mothers and for the eyes of all babies that are born into the world.

## CHAPTER XV

### THE ABUSE OF LISTERISM

Every new access of human power, of whatever kind, tests the fundamental thinking of the generation which receives it. The use of steam and wheels for industrial purposes leads to the evils of industrialism, and people desire the return of the " good old days " before such things. Aeroplanes and submarines are used for military purposes, or for " sport " with money in it, and we wonder whether these " fiendish inventions " are worth while. As we are about to see, the same objections may be raised even against Listerism.

If we are to keep our heads in such times as ours we must hold hard by one certain and fundamental proposition, which is true of all forms of power, and most evidently true of that form of power which we call knowledge. This is the proposition that no kind of power or capacity is good or evil in itself: to which may be added the proposition, less evident, indeed, yet certain, that the good will outweigh the evil in the long run. Dynamite may entomb or untomb ; radium may cause cancer or cure it ; light may give life or death ; alcohol may be used outside the body or abused inside it ; the knife may kill or cure ; money may be a root of all evil or a root of all good ; intellect may curse mankind with a Napoleon or bless it with a Pasteur.

The fruit of the tree of knowledge is both good and evil; and the argument against any kind of knowledge or power may be turned, if it be once admitted, against all kinds of knowledge or power. But it cannot be admitted, for the evident reason that power is non-moral, and may be indifferently turned to good or evil ends. The business of those who wish the good is to turn all forms of power more and more to that end, convinced that, if they will, there may be good in everything.

Before we come to our special subject, the foregoing argument may be illustrated, and the importance of first principles gauged, by reference to one or two recent instances, where the rapid achievements of man's intellect have outstripped his capacity for moral and emotional adjustment. It is perfectly evident that the discovery of the means whereby neo-Malthusianism so called may be safely practised, is one which may be and often is turned to immoral ends; and the recognition of this fact, together with the feeling that the device is unnatural (as if every human invention, cooking or a wheel or a tool, were not "unnatural"!) leads many to condemn this form of knowledge entirely. Yet a case for the legitimate and valuable use of neo-Malthusianism may be stated. Again, there was much outcry, not many years ago, when Prof. Metchnikoff devised a medicament which offered a considerable measure of protection against forms of disease which are commonly associated with loose living: though it is easy to find cases, say in the finger of a surgeon infected in doing his duty, where Metchnikoff's device may be turned to good ends. It is significant of the development of public opinion that, so far as one can observe, the so-called moral objections to Metchnikoff's work have

received no expression in connexion with the work, a few years later, of Ehrlich, in the production of a rapid therapeutic agency against the same infection. But, whether vocal or not, there will be many to believe that the new forms of power which these investigators have placed at our disposal were better unknown, and if we are rightly to meet such objectors we must clearly formulate our own first principles.

All this is by way of an introduction to the question of the abuse of Listerism. We see clearly that the possibility of this abuse involves no reflection upon Listerism itself, any more than the possibility of sunstroke compromises the beneficence of the sustainer of all terrestrial life. Further, we must be by now overwhelmingly convinced of the value of Listerism, and therefore may freely discuss its abuse without fear that the beam may fall on that side, and without any sense of disloyalty to man's best friend in need.

Obviously there must be many ways in which a power so great, so versatile, and confined for its wielding to so few, may be abused. It does not, indeed, lend itself to the secret purposes of the murderer, except in one way, as do modern bacteriology and the refinements of modern *materia medica*. But, short of that, Listerism is capable of all kinds of abuse, and to these it will continue to be turned until many radical changes are made in the present relations between the medico-surgical profession and the public.

In the first place, Listerism, capably practised by a gynecologist, offers a practically safe and rapid means, leaving no ill traces, of performing ante-natal infanticide. This operation is another illustration of the difficulties in which modern powers involve our ethical conceptions. Sooner or later we must look

upon it as one which practically does not at all endanger the life of the mother. Listerism makes that difference: and our ethical judgment must accordingly be determined by the question of the child. Notwithstanding that I am a student and enthusiastic advocate of what I call "negative eugenics," I am quite convinced that, even when Listerism has thus enabled us to disentangle the issues, ante-natal infanticide must be wholly condemned, apart from the special cases, everywhere approved of, in which local considerations of grave disease make the operation imperative for the life of the mother. Apart from such cases this operation is to be condemned, and is particularly to be noted as entirely outside the sphere of eugenics, no matter how degenerate may be the young life in question. The concern of eugenics is with parenthood and selection for parenthood, not selection for life. It works by a selective birth-rate, not a selective death-rate: and its moral *status* and practical success are immediately and gravely imperilled directly we begin to propose, in its name, the taking of life at any stage whatever, born or unborn. No decent person can have anything but contempt for the blind and malignant cruelty with which the law and public opinion pursue the young mother in such cases; nor can those who know anything of working-class life very well refuse their sympathy to the overworked wife who seeks the aid of a professional murderess of the unborn. But when this has been recognised we may still be convinced that the application of Listerism to these purposes—except where, for instance, the development of the young life can only be followed by its destruction and that of the mother—is an abuse of it, rightly to be condemned and prevented by the

law and by public opinion. There occur, every day, all over the world, in our present conditions of worse than barbaric defiance of eugenics, cases where the performance of ante-natal infanticide would be the lesser of two evils—lesser, say, than the birth of a hopeless idiot—but this operation, however safe it may nowadays be to the mother, is not to be permitted, because the admission of its rightness is too dangerous, and because such admission would prejudice the universal adoption of the right means whereby such calamities as the addition of idiots to the community may be averted. Since this is not a text-book upon the principles of eugenics, I must turn away from further discussion, but it will suffice to say that the new life which is not desirable, and for which the best conditions are not to be provided, should not, and some day will not, be called into existence at all.

This last consideration renders necessary some reference to the operation for non-mutilative sterilisation, by section or ligature of the germ-cell-bearing ducts in either sex, which offers a safe, certain, simple, rapid, permanent, and irrevocable means of interference with parenthood. Brief allusion has been made to this operation in a previous chapter. Quite evidently it may produce the same result, in the long run, as the performance of ante-natal infanticide—which I suggest to be the proper title for the operation which has just been condemned. That result is, however, by no means necessarily an evil one, and therefore every means thereto requires ethical judgment on its own merits. Continence interferes with conception, and so do economic facts which delay marriage: but these are not necessarily to be condemned. The production of abortion is the taking of

life, and it is rightly condemned by the law. Avoidance of the conditions which are necessary for the making of life is evidently in a totally distinct category. Thus we find that, whilst all civilised States penalise the production of abortion except in order to save the life of the mother, at least one State, that of Indiana, authorises the performance of sterilisation upon certain kinds of criminals. The minds of thoughtful people are indeed probably convinced by now that there may be cases where this operation is justifiable, if not even demanded by justice, and the case need not be further argued here.

Most obviously, however, there is here a possibility of the abuse of Listerism. That has been quite evident to those who, like the present writer, have now for many years advocated sterilisation as a measure of negative eugenics in certain cases. It was plain that, when men, in particular, became aware of the facts of vasectomy, many of them would seek to have the operation performed upon themselves, and that both married and unmarried persons, of both sexes, might seek to have recourse to sterilisation. I am now credibly informed that what was certain to happen is already happening in the United States of America, where the Indiana provision has acquainted the public very widely with the possibilities. In Great Britain one still has to explain, on every occasion, that sterilisation is not emasculation or defeminisation—even so lately and in such a journal as *The Lancet*, in September, 1911, some of whose medical correspondents waxed wroth with sterilisation in the belief that what Eugenists advocate is castration. On the other side of the Atlantic the precise and narrow consequences of the operation are known, and an American observer has assured me that many

men are now seeking and finding surgeons for the performance of this operation. In many cases the operation would be justifiable according to my eugenic creed. But in many others it will be evident that, in more ways than one or two, its performance must be an abuse of Listerism.

Plainly the feasibility of this procedure, and the general acquaintance with the facts, opens a new era in the matter of sex-relations. That is a large statement, but time will justify it. The operations of vasectomy and salpingectomy are often performed for other purposes than sterilisation. They are not illegal and never will be illegal. Like other immense powers of man—for these are immense, stupendous powers—these may be turned to great good or great evil, used or abused in proportion to their magnitude. I believe that in this sensational and staggering new case, the good will ultimately outweigh the evil, if not at first. It will behove us to keep our heads.

The sterilisation is irrevocable, and final, a fact which sharply differentiates it from what is called neo-Malthusianism. The young man who has it performed upon himself for his nefarious purposes will never become a father; and even though his condition as a bachelor may prove to be the physical salvation, in some degree, if to the moral undoing, of women, it must assuredly be made known before he marries. The law will require to grant a woman immediate dissolution of marriage if it be shown that her hubsand has had this operation performed upon him.

There are many beastly men all the world over, who will live a beast's life, as the saying should be but is not, in any case. The surgeon may well question whether it is not a service to the present and the future

to assent to such men's request for sterilisation. We desire neither their illegitimate nor their legitimate children: but no woman must be deceived into marrying a man who is such that her marriage will deprive her of the chance of motherhood. The reader who begins to realise the complexity and magnitude of the questions here involved should read the three plays of M. Brieux recently introduced to English readers by Mr. Bernard Shaw. *Les Avariés*, which I have so long commended to English readers (now translated as "Damaged Goods"), does not bear upon this question of sterilisation, but *Maternité* and *Les Trois Filles de Monsieur Dupont* do; and one is the more likely, after reading them, to be wisely prepared for that reconstruction of sexual morality and practice which alone can save our civilisation from the fate of all its predecessors. To that reconstruction Listerism, no longer abused, will contribute.

Yet another abuse of Listerism is now decadent. The time has passed when operators freely exploited their new powers by the extirpation of the ovaries, careless of remote consequences. At one time this had become a serious scandal. The operator was not a physiologist, and had no clear idea of the unity and interdependence of bodily structures. If it was evidently necessary to remove one ovary, and the other was in a doubtful condition, why not remove that also? The new power which Lister had placed in the hands of surgeons was too wonderful not to be exploited beyond the limits of lasting utility. But of course the time came when the physiology of the ovaries was better understood, and when their importance in contribution to the femininity and the health and happiness of woman came to be recognised. No sooner did surgeons in general come to realise

what they were doing than this abuse fell into abeyance.

The most serious abuse of Listerism at the present time depends upon economic causes, and can be understood only if we study the very singular and anomalous relations of the surgeon to the public so far as money is concerned. Briefly, it may be said that, on the one hand, surgeons do a great deal of highly-skilled and valuable work for nothing, and that, on the other hand, they are absurdly overpaid when they are paid at all.

This overpayment depends upon many causes. For instance, there is the still remaining tradition that a surgical operation is a rare and tremendous feat, which only a rare and consummate genius can perform, and which must be paid for accordingly. Again, the surgeon must maintain his fees, or his ostensible fees, at the highest possible figure, in order that the public, which has no other criterion, may estimate him accordingly, or in order that he may be able to charge it on the rare occasions when a very wealthy patient comes his way. But other causes of this overpayment are more serious and effective still.

The surgeon devotes the greater part of his time to entirely unpaid work. Several mornings or afternoons in the week he will visit the hospital and perform, say, a thousand pounds' worth of operations for which he receives nothing. When, therefore, he gets a paying patient, he is compelled to charge as high a figure as possible. The economic fact is that the paying patients pay for the hospital patients: and though this is a form of charity, it is a highly undesirable one, which injures all concerned, as we shall see. Its full measure can only be appreciated,

however, if we realise that the surgeon commonly has to wait many years, doing unpaid work all the time, before he gets paying patients, and that this period of harvest, for which he has been preparing for, say, twenty years, only lasts for ten or fifteen. The patients whom he can obtain in that brief remunerative period must pay for all the unpaid work which the surgeon still performs, and for all the years of education and unpaid work which preceded it. Of course the whole basis of such a system is rotten, and it cannot last much longer.

But whilst it does last, it does abundance of harm. The patients who get their surgery for nothing are demoralised, in large degree, as anyone who has first-hand experience of hospitals will admit. Numerous patients who could afford a just and reasonable fee, but cannot rise to the level of the surgeon's present demand, pocket their pride and avail themselves, in the hospital, at no expense at all, of services for which they would otherwise have had to pay an exorbitant sum outside. They must either pay nothing—which is much too little, or else a great deal too much. This is not good for them or for anybody; and its causation must be remembered when we are discussing the evergreen problem of hospital abuse.

The arrangement also harms those who do pay, for it robs them, and it often induces them to delay or to forgo an operation which is immediately necessary.

Finally, it is calculated to injure the surgeon. This invaluable and highly-skilled member of society, beside whom it is hard to name anyone for utility and beneficence, finds himself in such an extraordinary economic relation to those whom he serves, that he can neither qualify himself to do so, nor maintain

himself whilst doing so, unless he can somehow obtain, against the competition of a large number of his fellows who are in the same position, a sufficient number of patients who will pay him huge operation fees.

Can it be wondered at, in such circumstances, that the absolute necessity of obtaining such fees should sometimes vitiate the surgeon's judgment as to the propriety of operating at all ? Far be it from any responsible writer to suggest that a large proportion of surgeons fall victims to the evident temptation. But a few of them undoubtedly do, nor is the fact to be wondered at. It does not necessarily involve any dishonesty. Dishonest men there will be amongst the ranks of surgeons, as amongst the ranks of bishops, and the enemies of surgery or of episcopacy will make the most of the fact, which is entirely beside the point ; but it needs very little comprehension of surgical problems to show that the moral question is no such simple one. The patient consults a surgeon, who may be unable to diagnose the disease with certainty. Time may clear it up, yet time may be appallingly lost in so doing. The disease may be one which requires complete removal, yet the surgeon cannot possibly say whether or not he will be able to extirpate it entirely : and something short of extirpation may give much relief. If he refrains on one ground or another, the patient may very likely go to a second surgeon, who may be of a slightly different temperament, preferring action to delay, or who may prefer " giving the patient the chance," or who may consider an incomplete operation very well worth while as a palliative. If such an operation is to be performed, why should not the first surgeon be the operator ?

Thus it comes about that the door is opened to the abuse of Listerism, by the performance of operations which were better undone.

Nevertheless I am of opinion that this is a rapidly diminishing evil. Quite evidently our estimate of the whole question depends upon the results of operation. Whenever an improvement in antiseptic or aseptic technique makes operations safer, so much the less is the objection to unnecessary operations. Whenever an improvement in anæsthesia makes the administration of anæsthetics safer, so much the less does it matter that an unnecessary occasion has been presented to them. And whenever improvement in the actual technique of operation adds to the surgeon's powers, the number of cases in which he can be reasonably certain of doing at any rate some good increases. It follows that the extraordinary advances of the last ten or fifteen years have vastly reduced the abuse of Listerism, for the simple reason that the modern surgeon can scarcely fail to be useful, in some measure at any rate, whenever he wields the knife. He may perform less than he promises, he may have to return to his task, he may charge very heavy fees when he charges any fees at all, but his procedure is now so safe, so versatile and so skilful that he very rarely indeed fails to leave the patient better than he found him: and when the chance of doing harm is so minute, it may be wrong to deprive the patient of even a small chance of doing good.

Whilst it was necessary, then, to include the present chapter in our discussion, I believe the reader may be reassured if it was his habit to suppose that surgeons are sharks, habitually recommending and performing upon others operations which they would not undergo themselves. The general advance

of surgery has made that belief impossible, for the simple reason that it would probably be difficult to find 10 per cent of the community who would not profit by surgical attention in one form or another—say in the matter of varicose veins in one situation or another.

If we desire to put this whole question on such a basis that the temptation to abuse may be reduced to vanishing point, we must set ourselves to the economic question, and seek to obtain and to disseminate sound opinions thereon, so that the public and the legislature may be prepared for the necessary and urgent changes in the economic relations of the surgeons, the public and the hospitals. Some reference has already been made to this subject, but it demands a special chapter if we are to see our way towards such reconstructions as will provide Listerism for all who need it, and fair remuneration for its practitioners. When the present volume was begun such discussions would have appeared merely Utopian, but the proposal of a great system of national insurance against illness is making a new epoch in Great Britain, and will doubtless be followed in all civilised countries. The medical profession is about to have the greater part of its economic relation to the public entirely reversed, being paid, and finding it pay, to keep the community in health; and under the new conditions we shall assuredly be able to realise the ideal which this book is designed to serve—the supply of Listerism, fairly, promptly, and unfailingly, to all—rich and poor, men, women and children, old and young, from the mothers on their natural thrones, which no revolutions can shake, down to the " sportsmen " who accidentally injure themselves instead of some innocent and lovely thing.

## CHAPTER XVI

### THE PROVISION OF LISTERISM

The foregoing chapters have sadly missed fire if it has not been made abundantly plain that surgery is of high sociological importance. Disease and disability are social facts which are also potent social causes. We have problems of destitution and its consequences, for instance, which all preceding generations have attempted to relieve, and now we begin to see that destitution can be prevented, because, as is clear, preventable or curable disease is responsible for an enormous proportion of it. The provision of Listerism is therefore of importance both to the individual and to the citizen who is concerned with fundamental politics. It may at any moment intimately concern the purse of any one of us; and even when we are quite unaware of any such concern, it may be doing so in the shape of rates and taxes required for dealing with social phenomena which the due provision of Listerism would have prevented.

The provision of Listerism now depends upon an economic grading of the community, and may be therefore discussed on that classification, though the results are very far from what might have been anticipated.

The wealthy few have little or nothing to complain of in regard to the provision of Listerism. I say

"little or nothing" because they may indeed complain that they have to pay very high fees which would not be demanded or necessary if the practice of surgery were placed upon anything like a sound and equitable economic basis. But of course these fees involve no hardship in the case of the really wealthy, and for the rest they have no cause of complaint. The best skill and attention in the world are at their disposal, and they are sufficiently instructed, in at any rate a large number of cases, to avail themselves of these advantages in time. The wealthy woman who has a slight swelling in her breast has had friends in a similar case, and she has learnt from their too often tragic experience that she should consult a surgeon at once. The fee of two guineas is of no consequence, and she does not delay in the hope of saving it—unless she be a fool indeed.

Not even the houses of the wealthy, as we have seen, can by any means satisfy the demands of modern Listerism: but specially built and perfectly equipped nursing homes are available at any rate in the great cities, and to these the wise patient who is fortunate enough to be wealthy will gladly consent to be removed.

The only other people who can at all compare with the wealthy few in these respects are the poor—not the struggling professional man or the inadequately paid clerk, but the really poor. They and they alone are supposed, at any rate, to avail themselves of the hospitals, where large numbers of them obtain for nothing the services of the same surgeons who serve the wealthy, and of equally competent nurses, together with every material Listerian protection and provision which money can buy.

That this magnificent provision should be made

for the poorest does honour to our civilisation as do very few of its more boasted triumphs. But it has many unsatisfactory features. In the first place, the provision is inadequate. There are not enough beds and theatres for all the patients who need expert surgical help: nor can there be so long as the economic basis of the hospital service remains what it is, and the causes of disease demanding surgical interference persist. Much more important, however, is the fact that it is entirely left to the ignorant, uninstructed, or disgracefully misdirected and suspicious poor to consult the surgeon. Popular education has given them no guidance in such matters, neither as to significant symptoms, nor as to the beneficence of surgery, nor as to the conduct of hospitals, nor as to the importance of taking disease in time. The fashion in which the poor neglect their teeth is a simple and typical illustration. Thus it follows that the finest surgical skill in the world, the most generous provision of superb theatres on the part of philanthropic donors, and the whole apparatus of a modern hospital are constantly set to hopeless, futile, or semi-futile tasks, being robbed of all or half their efficacy because they are not employed in time.

This point is tragically familiar to all who have any hospital experience, in such common cases as cancer and surgical tuberculosis, where time is of the essence of the problem; and when we remember how often the poor are misinformed—as by the anti-vivisectionists—and decline to avail themselves of the surgeon's help even when they have consulted him, we shall realise that not even the provision of skill and service and everything else suffices without some kind of machinery acting outside the hospitals.

That machinery will in a large measure be pro-

vided in Great Britain by the system of national insurance. The greater part of the patients who belong to the class now under discussion will be so insured that they have a doctor to consult even for merely suspicious or inconvenient symptoms. Instead of waiting until the symptoms become intolerable they will consult a doctor at once, just like the well-to-do. I therefore anticipate, as one immediate result of national insurance against illness, a great increase in the proportion of patients whom hospital surgeons see in time. But only surgeons themselves can adequately estimate the value to their patients and the satisfaction to themselves of such a change, which will mean that much of their skill and labour, now thrown away because deprived of a fair chance, will be made really available for life and for health.

An immediate, though for the best of reasons by no means a lasting, result of the establishment of a system of national insurance must therefore be a considerable increase in the pressure upon the surgical wards and theatres of hospitals—an increase which must hasten the inevitable change in the economic basis of these institutions. That this change is indeed inevitable we shall realise when we proceed to consider the provision of Listerism for the great middle-class, which can neither afford the fees of the best surgeons nor bring itself to enter the hospitals, even if patients of this class were expected there.

As everyone knows very well, surgical provision for this class does not exist. Even the consultation fees of two guineas for a first and one for subsequent visits, are a serious matter, but the expense of an operation together with nursing and incidentals is ruinous. What the poor may get for nothing would cost the middle-class man perhaps two hundred

pounds, which may be a year's income—say of a curate or clerk or what not.

We shall see in the next chapter that before many decades are past these difficulties will have settled themselves in the best of all imaginable ways, but for some years to come they demand a more direct solution than by the progress of bio-chemistry and bacteriology. Adequate and just provision must be made for all classes and all individuals—not merely the millionaire and the pauper, but for all who lie between those extremes. This provision must not be made, and indeed cannot be made, at the cost of surgeons. No profession can compare for a moment with theirs for the value and extent of the services which they render to the State for nothing; but this is indeed a dangerous form of charity, very apt to injure, in subtle but real ways, him that gives and him that takes.

This arrangement whereby the best surgeons—since they alone get the practice they are bound to be on the average the best surgeons—give the greater part of their time to the poor, lacks many of the aspects of true charity. It is indeed imposed upon the giver. He must have his hospital connexion if he is to have his private connexion, both for experience and for reputation, and for the chance of teaching students who will subsequently send their cases to him. The charity is therefore more apparent than real to-day: and the allegation is none the less reasonable if we remember the quite outrageous fees which the surgeon obtains whenever he can: fees which physicians of corresponding *status* and skill and usefulness never dream of asking. But these outrageous fees are the hope and the reward of the hospital surgeon who definitely accepts that career:

and the work he does for nothing must be understood accordingly.

But this is not the only argument against the arrangement which deprives the middle-classes of the best surgery at a fair price and demands unfair prices from the wealthy. For we are just beginning to perceive that the whole theory of charity (of the right, constructive, preservative kind), as a service rendered for love to individuals, is imperfect. "England has need of men": every State has need of men and women. The surgeon who accurately sets the workman's broken limb, or saves his sight, or his teeth, is not merely serving his patient. He is serving the State, the King, if you will, even the ratepayer. The community to-day is not an aggregate, if it ever was, but an organism. The daily work of the hospitals may be looked upon as charity from one aspect, and is certainly charity so far as generous donors are concerned. But it is also constructive politics, of a reality such as is very seldom approached upon the floors of our legislative chambers. The surgeon is a great servant of society: the master-surgeon, who achieves some beneficent innovation, is no less high and illustrious a servant of the State than a "prancing proconsul" or a Judge of the High Court. It might very well be argued that the extraordinary crassness and blindness of the medical profession as a whole to the social and sociological idea is as much responsible as the public stupidity for the fact that these assertions are not the stalest platitudes. But whatever the explanation be, there is the fact that the exalted function of Listerism in the modern State is appreciated nowhere, least of all, perhaps, by surgeons themselves. Until it is recognised, the provision of Listerism will never be

adequate, nor surgeons and surgery held in the honour which is their due, or would be their due if they were not still imbued with the individualism of half a century ago.

The State must help the hospitals. The work done for them by surgeons and physicians must be moderately but decently paid for by the State, whom they serve: and by such patients as have the means. In other words, the hospitals must be brought into the great schemes of national medical insurance which will soon be part of the structure of all civilised States. It is time to put an end alike to the much-resented "abuse" of the hospitals by patients who, whilst not "poor," are yet unable to afford the surgeon's fees, and to the other economic abuses, including the overcharging of the well-to-do, which have grown out of our hospital system.

The great voluntary hospitals are the pride of our civilisation, and their independence is their dearest boast. Under it they have attained a measure of efficiency in the treatment of disease which is excelled nowhere; and we should do ill to deprive them of it. They are rightly jealous of their liberty, and I, for one, should be sorry to interfere in any way with the flow of benevolence upon which that liberty depends. But this does not mean that the hospital system is perfect, or that it is incapable of improvement save at the cost of its characteristic features.

The reasons why we must deny perfection to the hospital system have in large measure been alluded to already. But the most serious reasons are yet to come. In the first place, the institution of out-patients is not only abused, but is in itself an outrage upon the ideas of modern scientific medicine. The herding together of patients, including children, in

a foul atmosphere full of infection, for hours at a time, is simply disgusting to the modern hygienist. Yet probably every medical reader of these pages can recall his experience of some great hospital where, so far as the in-patients were concerned, the arrangements, the service and the results were on the way to perfection, whilst the out-patient department belonged to the dark ages.

Undoubtedly many infections, and above all that of tuberculosis, must thus be spread by the hospitals. Whilst curing disease they thus serve most unfortunately to cause it : and this prepares us for the great indictment of the modern mind against these magnificent institutions, which to the nineteenth century seemed the last word in human provision and achievement regarding disease. The hospitals do nothing to prevent disease. As I have shown, they even spread it : but the indictment is grave enough that, in these days when causation is studied on all hands, and prevention is the key-word of the future, the hospitals, with their superb opportunities in the matter of money and skill and prestige, do nothing to prevent disease.

My business in this chapter is simply to discuss the provision of Listerism, and I must not unduly anticipate a greater question still. But it is relevant to our present discussion to show that, whilst the provision of Listerism by the hospitals is admirable so far as it goes, it lacks the great qualification of all medical and surgical provision of the future, that it must be at once curative and preventive.

One thing only, but that effectively and finally, can put the hospitals into their right place in the hygienic and therapeutic provision of the future State. Instead of being the enemy of the private

practitioner outside, the hospital must be his friend. At present we see these two great institutions, the hospital and the private practitioner, who should be in exquisite co-ordination and co-operation for their mutual and for the common good, working at cross-purposes, as far as possible independently, but with mutual injury. The hospital doctor, working for nothing, not because he is more charitable but because he is more successful and makes his money out of the system indirectly, is the enemy of the outside doctor, who lives by the patients whom he can keep. Could anything more stupid and vicious be imagined? These "professional brethren" are so placed that, at every point, they hamper and interfere with each other's work, to the inevitable injury not of themselves only, but of the community at large. The outside doctor loses money whenever his patient, *not being a contract patient*, enters the hospital. It is not to his interest to send his patients at the earliest moment, say when a doubtful cancer is present, and thus the utility of the hospital surgeon is often frustrated. Neither the hospital doctor nor the outside doctor is in the least concerned to advise the man who smokes until he hurts his tongue, or allows a jagged tooth to irritate it, that he must remove the cause of irritation, or cancer will very likely be the result. The hospital surgeon can open a tuberculous abscess in a clean fashion, and the hospital nurses can keep it clean: but the outside doctor must live, and he opens the abscess himself, so that the hospital surgeon does not see it until there is a mixture of microbes present, confronted with which his knife is impotent to save, and his superb aseptic technique a mockery. And it is the business neither of the hospital surgeon, nor of the outside

practitioner, to teach parents that they must not give unboiled milk to young children until vested interests and apathy and ignorance are permitted no longer to poison us with the milk of tuberculous cows wherever milk is drunk at all.

Evidently if we are to achieve what we shall achieve, and send tuberculosis to keep company with typhus and leprosy, we require a fundamental alteration in the system which daily produces such deplorable results. Not only do we require it, but so far as Great Britain is concerned we are about to obtain it. The system of national insurance which, I hope, will be set to work a few months after the publication of these pages, will necessarily mark an epoch in the provision of Listerism, to mention nothing else, by the most radical imaginable alteration of the conditions of medical practice in this country.

As I have repeatedly pointed out in my attempts to aid the passage of the National Insurance Bill, it establishes the only rational condition of medical and surgical practice in the twentieth century, in that it pays the doctor for health and not for disease. Hitherto, the doctor has profited by illness, and where there is health he starves. But under a fair system of contract practice, it pays the doctor to maintain the health of his patients and of the community at the highest possible standard. In his own professional interest he is bound to become a teacher of hygiene, a temperance reformer, and even a Eugenist. If, however, his instructions have failed, and he is confronted with, say, a case of "surgical tuberculosis," which wise precautions about milk would have averted, the practitioner will be no longer tempted to undertake the task of opening an abscess which will thereafter never close, since its secondary infection is

certain. The hospitals, which have so long robbed the general practitioner, now become a godsend to him. Why on earth should he face the trouble, the labour, the risk, the prolonged and hopeless post-operative course, of a tuberculous abscess, when the hospital is available to relieve him of the case, to deal with it under the best conditions, and yet not rob him of a single fee? Plainly, so far as this sort of thing is concerned, the bad old days are practically over. The surgeon inside the hospital and the general practitioner outside it must forthwith become professional brethren indeed, working into each other's hands at every point. It is no longer to the interest of the practitioner to watch doubtful cases of cancer until they become certain—and hopeless. It is no longer to his interest to treat a single case, indeed, which the hospitals will accept. It is plain that any friction which may hereafter arise between the hospitals and the outside doctors will be very different from that of the past, and the hospitals may have to protect themselves. But at any rate their surgeons will get their cases much earlier than ever before, and will also get many cases, suitable only for hospital treatment, which they would not otherwise have seen at all. The gain to the hospital surgeons will be enormous so far as their results, and therefore their satisfaction in their work, are concerned. A vastly increased number of patients will pass through the hospitals, whilst the average number of days spent in hospital by the patients will be greatly diminished owing to the surgical advantage of earlier treatment, and of treatment which is not complicated by disastrous attempts already made outside.

The work of the hospitals will be greatly lightened

so far as the out-patient departments are concerned. There should be no such places. Outside doctors ought to be able to deal adequately with this class of case, and under a general system of insurance the patients will be able to consult them. I am well aware that initial proposals can deal only with certain classes of patients, but I am now discussing the principle in general, well knowing that it will be applied, before very long, to women and children also, in this and all other progressive countries. The money and space thus saved in out-patient departments will be made available for the obvious and proper function of a hospital—to treat patients who cannot be properly treated otherwise than in a hospital. The out-patient department will be retained for accidents, and for all manner of specialities, such as the treatment of the eyes and ears, in which the general practitioner cannot possibly attain sufficient expertness; but the general out-patient departments will disappear, to the great advantage of everyone concerned.

Not only the surgical wards but the medical wards also of the hospitals will soon discover that, under a system of national insurance, the pressure upon their space greatly rises. They offer advantages which are paralleled only in the nursing homes provided for the wealthy; the prejudice against them is steadily breaking down; and the entry of (insured) patients into them no longer robs the doctor, but saves him time and money and responsibility. These considerations are perfectly evident, but they have hitherto been taken very little into account. The proposed system of insurance in this country has been discussed from the point of view of many special interests; but too little from the

point of view of the public welfare at large. The hospitals have been completely left out of the scheme ; a sufficiently extraordinary circumstance when one considers the part they play in the treatment of disease, and their increasing importance under recent developments of medical and surgical method. It is, I believe, correct to say that only one question has been discussed—and that, from the national and hygienic point of view, the least important of all. It has been feared and argued that the subscriptions to the hospitals will fall off. Very probably they will, though possibly they may not : but what a question to trouble about when we are creating a great national system of dealing with disease! Our real business, of course, is to ask where the hospitals should come into the system, and how they can be made most serviceable, recognising their unique and indispensable position in relation to the whole problem. Instead of this, we have invented a huge system which ignores the hospitals altogether, and we take notice of their existence only to speculate whether they will " suffer " by the reduction of the subscriptions of the charitable.

But, indeed, we are establishing conditions so extensive and so novel that the hospitals will be greatly affected, whether or not we suppose ourselves to be leaving them out altogether, whether or not their subscriptions rise or fall. As I have already shown, not only do we go far towards abolishing the general out-patients' departments, but we are going to increase enormously the demands for admission to the wards, and we are actually reversing the economic relation — at present simply insane — between the doctor inside and the doctor outside the hospital. Very plainly, therefore, the hospitals are coming into our scheme, whether we realise it or not.

The system of the future, towards which the proposed national insurance is, of course, a mere step, will certainly not leave out the hospitals: but the present scheme is quite sufficient to involve the hospitals very closely.

There has already been talk of paying sums to the hospitals on account of insured patients whom they treat: and this marks the beginning of the end of their present economic basis. The hospitals glory in their voluntary character—even though they be compelled to close whole wards for months at a time—and those who serve them greatly resent the notion of State supervision. These ideas are out of place in the present century, and they must certainly be abandoned. Whatever their economic basis, hospitals are institutions of society, performing great and necessary social functions, and the only business of the real politician is to do whatever may be required to aid them in performing those functions better than ever. Something is wrong when hospitals have to close wards for lack of funds, whilst patients are suffering outside, and the nation's efficiency is weakened in proportion. Something is wrong when surgeons in the hospitals, working under the most admirable conditions in all other respects, and unsurpassed in their skill, are doomed to a large measure of failure because they do not get their patients in time. Something is wrong when, in this twentieth century of science, and the recognition of causes, these magnificent institutions are confined to the function of curing disease—which is more commonly not cure but only relief or palliation—and do nothing to prevent it.

These anomalies and archaisms are already doomed in this country by our system of national insurance. Yearly the State becomes more organised and organic.

As Mr. Ramsay Macdonald has justly observed, the old nineteenth-century antithesis, "the Man *versus* the State," which meant so much to Herbert Spencer and his contemporaries, is becoming an absurdity. The hospitals cannot possibly stand outside the structure of the highly organised State of the immediate future.

In taking their due place as organs of the State, the hospitals need lose, and will lose, nothing whatever of their present dignity. If they accept money from the State on account of insured persons, as they will certainly have to do, doubtless they will have to submit to some measure of State inspection. But why not? They have nothing whatever to fear; why should they behave as if they thought they had? All manner of institutions are now inspected, and even private individuals such as physiologists holding certificates for experiments upon animals. These lose no dignity by the process, nor need the hospitals. The inspectors would naturally be elderly physicians and surgeons of the highest standing, such as now watch over the interests of the insane; and their work would simply involve helping the hospitals by their experience and advice. The prejudice against the hospitals which exists in many minds, and which is nourished by the unscrupulous inventions of some of the anti-vivisectionists, would be all the more rapidly dissipated if it were known that they were inspected as lunatic asylums most rightly are inspected already. Whosoever please may maintain voluntary hospitals hereafter as heretofore, whether on account of special modes of treatment, or to satisfy the individualism of their temperament; and such institutions will serve many valuable purposes. But the great existing hospitals, which spend

such huge sums of money, and which perform the great national function of training future practitioners—these will be required, in the future, to do their work far better than in the past, or at present, even granting that their services are already incalculable in value, and by no means to be replaced.

The fear that subscriptions to the hospitals will fall off is entirely justified, and quotation of the supposed experience of Germany to the contrary may be ignored. Workpeople who have hitherto regularly subscribed small sums, by no means to be despised in the aggregate, will cease to do so, now that they are to pay a weekly tax for the same purpose. Employers are already making new arrangements in this respect, nor can they very well be blamed. Many of them, in the first place, having no charity in their souls, have subscribed to the hospitals for appearance' sake, and in order to have a claim upon them for their employees. Many have thus saved themselves, many times over, the cost of their " charitable " subscription. These, of course, will now cease to subscribe. But others will be no less justified in doing so. In many cases their annual contributions, by way of insurance, will amount to thousands of pounds, and there is no reason or justice in expecting them to subscribe any more.

The resources of the hospitals will therefore undergo a rapid and enormous shrinkage just at the very time when the demand upon them will be greatly multiplied. This demand will mainly be made by patients who are insured, and it is quite evident that the hospitals will have no choice but to deal with these patients and be paid for them.

In ten years the hospitals will be what they should

be, and what they must necessarily become, whether they should or not. They will be great organs of the State, supported by the State, served by a superior and specialised race of competent and properly remunerated doctors. There will be many to declare that this is "the end of all things"—as the backboneless said of the first vertebrates, the reptiles of the first birds, and so forth—but such voices will not belong to those who know the present facts and do not personally profit by them, as most of the so-called leaders of the profession do to-day.

The provision of Listerism will then be made perfectly adequate to the need—which itself will undergo profound and rapid changes, as we shall see in the concluding chapter of this study. If more beds are required than already exist, they will have to be provided. Many of us hold that the name and dignity of charity are poorly served by the present spectacle of the hospitals, for ever begging the contributions of the charitable, declaring that "funds are urgently needed," often closing wards for economy's sake, competing with one another for public support by every manner of advertisement, and withal lending no hand whatever in the prevention of disease. Real charity is of a different order. The community has a duty to the ill, and its duty to them is also its duty to itself, on the grounds alike of national efficiency and national economy. When we come to look at disease sociologically, we discover that by far the cheapest way of dealing with ill persons, consumptives or whatever else they be, is to cure them, if possible. Failing cure, they become a burden upon the community in workhouse and prison and asylum. The provision of the best medical and surgical treatment for ill persons is therefore a necessary

duty of the State, second only to its duty of preventing illness altogether.

In the course of making these great changes, and placing the hospitals in their due place in the future State, the public will be compelled to listen to many dissonant voices. Let us beware. The man who has succeeded in establishing himself in a favourable relation to the present system, and who is also commonly a conspicuous representative of the profession, cannot be looked upon as probably an impartial witness. It may be replied that, if the public is not to trust the leading consultants in such a matter, whom can it trust? To this the reply is that the medical profession, in these latter days, begins to include amongst its members not a few who are supremely entitled to be heard, and who speak without prejudice. The man to listen to is not he who makes huge fees out of his hospital connexion, for which he has waited and expended money and labour for years in the past: but the leading members of our Preventive Medical Service, who alone are capable, by their experience and their relation to the problem, of looking at it from the only possible standpoint for our times, which is that of prevention. These great authorities are almost all in official posts, and are forbidden to direct the public. The more's the pity, for there would be no reply to their arguments. Prof. Benjamin Moore has done great service, in his "Dawn of the Health Age," in discussing these questions candidly and with authority, and it is earnestly to be desired that the intelligent public should acquaint itself with that book and with "The State and the Doctor," and "The Prevention of Destitution," by Mr. and Mrs. Sidney Webb, of whom I lately heard it said by the chief

official of hygiene in these islands that they had done more for dealing with the social problem of disease than anyone else now living. Those who look upon these matters from the standpoint of the practitioner essay no reply to such books as these, for the excellent reason that they cannot.

This great and beneficent change is much nearer at hand than most of us realise, for the majority of the medical profession will soon be in favour of it. The life of the general practitioner has been becoming steadily more difficult for many years past. He is doomed practically to disappear, but for a few more years the Insurance Bill, which confers so many boons upon him, will give him a new lease of life. His first discovery will be that the hospitals, hitherto his enemies, are now his friends. The more he can avail himself of them, the better paid and the lighter will become his work. At first the hospitals will simply have to turn away a multitude of their new would-be patients. Later, accommodation will have to be provided for them, under the new economic conditions, and the change will equally suit the general practitioner and the new entrants into the medical profession, who will find gradually opening to them a far larger number than ever heretofore of those properly paid posts which are already beginning to withdraw from private practice a very large proportion of the best young brains of the profession.

All this will be to the good, deplore it who may. The monopolists may suffer, but they have had their day. The truth is that the advance of science has rendered general practice under the old conditions simply impossible. All over the country, no doubt, and especially in the rural districts, it is still main-

tained, but it is not modern medicine, nor anything like it. There are still men who wash their empty bottles into a large receptacle labelled A.D.S., and use the contents for their poorer patients—the mystic letters simply meaning Any Damned Stuff. But their hour has struck.

Consider the problem of the honest general practitioner who is faced with any one of a hundred types of case which, in the past, were simply treated with drugs which cloaked the symptoms. Diagnosis is no longer made merely by listening to the chest, feeling the pulse, taking the temperature and so forth. It involves all these as preliminaries, and then much more. This much more takes a very long time, a variety of expensive apparatus, and much expert skill. The blood must be examined in half a dozen ways. The "opsonic index," perhaps, must be estimated. The bacteriology of the case must be investigated, and inoculations may have to be made into living animals. Finally, it is quite likely that some kind of serum or vaccine will have to be prepared from the bacteria which have been obtained from the patient.

These are not exceptional cases. They are everyday necessities in the modern hospital, and daily call for the services of half a dozen experts and hundreds or thousands of pounds' worth of laboratories and apparatus. In such hospitals these things are at the service of the poorest patient. How on earth can the general practitioner maintain this kind of standard, or anything remotely approaching it, for his private patients? Even if he had the knowledge and the skill, which no one man has, even if he possessed the laboratories and the apparatus, somewhere in the wilds of Sussex or Argyllshire, he has not the time.

The problem is many times over insoluble, by the nature of the case, but we have no sooner said so, and admitted that these are the demands which modern science makes on behalf of the invalid, than we have admitted that the greater part of general practice must disappear.

Recently, in a remote corner of Scotland, I met a general practitioner of the very best type, who had been a fellow-student of my own, and who had acquired particular skill in the examination of the blood and in surgery. "I have not done a blood for seven years," he told me, meaning thereby that he had not made a single examination of the kind which, ten years before, he had made many times over daily in hospital. When I asked him about the Insurance Bill, he said it did not affect him personally, "But of course we are all fighting it, shoulder to shoulder." Like tens of thousands of other practitioners, he had not read the Bill, and was completely misled by those who have done the profession so little honour in this matter. He knew very well that general practice, as he was compelled to carry it on, to the best of his no small ability, and working very hard indeed, is a farce and an anachronism, and cannot possibly be anything else. He knew that half the training of his student years, and all his skill in hæmatology and surgery (which he had entirely given up, sending his cases to Edinburgh) were completely wasted, but he saw no way out. The revolution of 1911–1912 provides that way out; and men like my friend, in the future, will do the work for which they have fitted themselves under proper conditions.

The solution of the present problem of the middle-classes is also not far distant: but it depends upon popular education in these matters. Surgical fees,

as I have already shown, are at present outrageously high—compared, for instance, with those paid to physicians of corresponding rank. Patients in London are charged two and three guineas for simple examinations which would be just as well performed in Paris for fifteen francs. The use of private nursing-homes too often degenerates into gross abuse, as when a patient in excellent health, who is about to undergo a simple operation, say for hæmorrhoids, is kept for three weeks before the operation, instead of one day or half-day, in a nursing-home where he is charged eight guineas a week, as a preliminary to paying a fee of fifty guineas to the surgeon. All this is going, though powerful vested interests are at work to prevent reform, as some recent cases testify.

There is, of course, no reason in the world why, in the near future, there should not be beds available in the great hospitals—as there now are, for instance, at St. Thomas's—where patients can be treated and operated upon by their own doctor, or by one of the hospital doctors, at reasonable sums. This much-needed reform will follow upon that breaking-down of the hospital surgeon's preserve which will follow from the establishment of national insurance.

Most important of all, from the national point of view, is the provision of Listerism for children. Medical inspection of school children is now revealing their need in Great Britain—a need which, one need scarcely say, can be readily paralleled in other parts of the world. Medical inspection having come, treatment must inevitably follow. In Great Britain in this year 1911 we have six million school children, subject to inspection, and at present under the care of about a thousand school medical officers. (The figure is small enough, but it illustrates my point that the

proportion of practitioners no longer engaged in private practice is rapidly rising, and will ere long alter the whole balance of feeling in the profession.) Of these children there are scores of thousands who require treatment for surgical tuberculosis alone. Some 8 per cent at least require the services of nasal surgery for adenoids, enlarged tonsils, etc.; and the greater number are in immediate need of dental surgery.

Provision for all this need must forthwith be made —and none the less because the State is now undertaking to pay for disease and its consequences in later years. The Insurance Bill begins nowhere near the beginning. What is to be done?

There can be no question—there never has been any question—as to the answer. The school authorities have sometimes tried to make arrangements for the treatment of these needy children by local practitioners. The fatal objection to this is that, taken as a whole, the local practitioners are hopelessly incompetent. Elsewhere the idea has been for the Education Authority to make arrangements for the treatment of its children in the out-patient departments of hospitals. This palpably mad and wasteful and cruel method has, for some time past, been adopted by the London County Council, at the instance of entirely unqualified and incompetent advisers. Here in London the consequences have been horrible, a continuous scandal of the first order, to which the Board of Education has repeatedly drawn attention in the severest terms. The Council and the Board are on opposite sides in politics, and the lives and eyes and ears and teeth of London's children have been sacrificed wholesale in consequence.

The only possible method is the School Clinic, long and triumphantly established in Germany, staffed by competent, modern practitioners who should, for choice, devote their whole time to this splendid work. Experts of various kinds will also be required to spend more or less of their time dealing with eyes and ears and noses and teeth. Every school must be connected with a school clinic, entirely its own, or shared with others, according to circumstances. Parents must be called into the business, and summarily prosecuted, if necessary, when they wilfully fail to carry out instructions. All this is, no doubt, a very bad look out for the incompetent general practitioner, but we must give up drugging for real doctoring in these days; and no State can afford to countenance any longer the type of man to whose mercies these children have commonly been left hitherto. All this scheme will take its natural and necessary part in the structure of the National Health Service of the near future.

In rural districts attempts are still being made, with hopeless consequences on the whole, to utilise the local practitioners. The only alternative is a travelling clinic for such districts, and to this we shall shortly come.

But it is the considerations advanced in the next chapter that will really determine future progress.

## CHAPTER XVII

### THE PROMISE OF THE FUTURE

To the distant historian the record of Listerism will appear curious indeed. Here is the most beneficent achievement of the human mind, coming to its maturity within a generation, when all preceding generations have gone without it, and then suddenly undergoing the most extraordinary decline in its scope, after threatening to supersede all other forms of treatment. This, as we shall see, is the development now at hand.

But, hitherto, in its brief and brilliant career, Listerism has advanced from one part of the body to another, and from one type of malady to another, until mere medicine threatened to disappear altogether. The surgeon has advanced from the limbs to the trunk, from the abdomen to the cranium, and from the cranium even to the heart, until it seemed as if the Listerian knife were to prove to be the long-sought panacea. The next stage in the history of its achievement will depend upon the fact that the very discoveries which have made it possible are now proceeding to supersede it. Let us consider some instances, and let these considerations find a place of prominence at the end of this volume, lest the commentator suppose that enthusiasm for Listerism has blinded the writer to the possibility of something far better.

Let us take the highly representative case of what

is usually called "surgical tuberculosis." A child has a "white swelling" of the knee-joint, which yields to no remedies. Later he suffers from starting-pains at night, and serious lameness. After injections of iodoform and other remedies have been tried, Listerism is called in. The surgeon exposes the knee-joint and removes it *in toto*. He apposes the thigh bone and the shin bone, each with a perfectly healthy raw surface, the disease having been completely removed, and they soon unite, giving the patient a single shaft of healthy bone from hip to ankle. This is a remarkable and triumphant achievement for Listerism, utterly unthinkable, because then simply murderous, to the surgeons of little more than a generation ago. All honour to the observers and pioneers and followers who have given relief in this fashion to countless victims of tuberculosis in the knee-joint.

But now let us consider. What is this tuberculosis in the knee-joint? It is a slow inflammation. Now Lister long ago declared and demonstrated that the more ordinary and acute surgical inflammations are due to microbes; and he showed, first, the excellent results of killing the microbes, and second, the still more excellent results of excluding them. Some fourteen years after Lister's beginning—in 1881, to be precise—Professor Koch showed that a special microbe, called the tubercle bacillus, is the cause of tuberculosis in all its forms. Needless to say, the Listerian idea has been applied ever since to this and all other cases of microbic infection. Whether or not the surgeon is called in, we seek to kill the microbes by means of medicinal antiseptics, just after the fashion of Lister applying carbolic acid to a compound fracture.

But though antiseptic medicaments, on the surgical principle, are now given in all manner of ways for all manner of diseases, their results are on the whole extremely disappointing. If they are to reach the remote microbes through the blood-stream in sufficient concentration, they must probably first kill the patient, as is daily illustrated by the abuse of the antiseptic alcohol.

But if the antiseptic principle will not avail, what of the aseptic? Why should we not, in our medical practice, and in our State Medicine, take a hint from the later development of Listerism, which aims at excluding microbes altogether?

For consider now the case of "surgical tuberculosis." Here is an exceedingly common and destructive disease, from which scores of thousands of school-children are suffering in Great Britain at this moment. It attacks the glands in the neck, the spine and long bones, the joints, especially the knee-joint and hip-joint, the coverings of the brain and the brain itself, the lining of the abdomen and the interior of the bowels. It is a brutal, chronic, desperately intractable, and exceedingly widespread disease which, in one form or other, is probably responsible for about twelve to fifteen thousand deaths annually in Great Britain, and for more pain and inefficiency and expense than words or figures can estimate.

Here, as we have already seen, Listerism frequently wins great triumphs, whilst the disastrous lack of Listerism, involving dirty surgical interference and mixed infection, is the most disastrous kind of treatment to which these cases can be subjected. But what if, in our State Medicine, we applied the aseptic principle, so that the microbes never reached our children's brains and bones and joints and bowels?

It is eminently possible, and merely wants doing. The facts are now known. The microbe responsible for the greater part of this damage—and for a good deal more, which not even Listerism can alleviate—is the bovine form of the tubercle bacillus. Some ten years ago Koch himself, rash genius that he was, announced in London his conclusion that the bovine form of tubercle bacillus is innocuous to man and that we need therefore take no precautions against it. Lord Lister himself, present on that occasion, forcibly dissented, and the matter was put to the test of an independent Commission, armed with powers not to examine witnesses and follow their opinion, but to examine the facts at first-hand, and report what they found. This Commission, after a decade of admirable work, has issued its final report just before I take up my pen for this final chapter, and in my argument I am therefore armed with definite evidence the gathering of which is a very real and notable service of Great Britain to the civilised world.

The Commission's work may now, must now, be quoted by the enemies of tuberculosis and the friends of man everywhere. Whether in Germany or the United States of America, in France or in Australia, the hygienist now has the authority of this Commission's work behind him in his formidable struggle against the vested interests which object to the reforms he demands. For the Commission have found that the bovine form of the tubercle bacillus, such as is found in the milk and the flesh of tuberculous oxen, *is* capable of causing disease in man, and not merely "surgical tuberculosis" so called, but also cases of phthisis or consumption. As regards the meat of the ox—and also as regards pork, against which wise Moses legislated—the evidence is clear,

but the overwhelming weight of the indictment falls upon milk, as many of us have been trying to persuade the public for many years past.

Since 1901 the authority of Koch could always be quoted against us, but this is now no longer possible. The facts have been demonstrated beyond all cavil. The Commission has proved that the bovine bacillus does the damage, and routine examination of milk shows that, in Great Britain, this bacillus is present in active form in approximately ten per cent of all the samples of milk that is supplied to our cities. The enormous and ghastly incidence of the disease is thus accounted for: and should anyone argue that there is not enough tuberculosis of the udder in our herds to account for this proportion of infected milk, the Commissioners reply with the demonstration that a cow suffering from tuberculosis in any part of the body other than the udder may yet use her milk as a vehicle of excretion of the noxious microbes.

The time for rational action has plainly come. The few may protect themselves by boiling or pasteurising their milk, or at any rate their children's milk; or by purchasing it, at high cost, from one of the very few companies which can be relied upon not to supply tuberculous milk. But only one measure will suffice, whether in this country or any other where bovine tuberculosis exists. We cannot give up drinking milk. In Malta lately, when goats' milk was proved to convey the microbe of Malta Fever, the order was given that none of our soldiers or sailors, stationed there, were to drink goats' milk in future—and the disease immediately disappeared. A similar remedy cannot be applied here, for milk is the most valuable of foods, above all for children. Further, even boiling

and pasteurising have their inherent disadvantages, and cannot protect us against butter, which may also be infected. We must abolish tuberculosis from our bovine population, if we desire to abolish it from amongst ourselves.

The National Insurance Bill, "for the prevention of sickness," does nothing whatever to prevent this most common and deadly disease. Insurance, after all, is not prevention, whether in the case of fire, or the case of disease; and whilst efficient treatment of pulmonary tuberculosis does involve prevention, by greatly reducing infection, nothing will prevent the tuberculosis due to the bovine bacillus except purification of the milk supply, and that can only be done by eradicating tuberculosis from our herds and keeping them free from it ever thereafter.

This will cost money; and the objection to any kind of Milk Bill is that it interferes with a large and powerful vested interest—but that cannot be helped. Britain has a vested interest in the health of her people, and before that all others must yield. When a question was lately asked in Parliament as to the possible regular inspection of our cattle with reference to tuberculosis, the answer was given that the consequent aggravation of the rates would be prohibitive. To this most wearisome and imbecile of arguments it has to be replied that nothing pays a country, in money as well as in life, like efficient public health measures, simply because disease is so frightfully expensive. The State is now undertaking to pay, and pay handsomely, for the consequences of illness and inefficiency. Even from the point of view of any Chancellor of the Exchequer before the time of Mr. Lloyd George, simply looking at the side of money, it is worth while to interfere with the causes

of disease. At present ratepayers and all other people pay, directly and indirectly, huge sums every year for the consequences of bovine tuberculosis, and as a much higher standard of comfort and care is promised for the ill and the unemployed in future, this sum will be greatly raised. Bovine tuberculosis is one of the great recruiters of hospital patients, in-door and outdoor, and whilst these great institutions, at vast and ever-increasing expense, yearly seek to cope with the flood of tuberculous patients, they do nothing whatever to prevent the disease. It may practically be said that no one has yet done anything in this country to prevent tuberculosis of bovine origin except the very few doctors who have spent any time in warning the public and endeavouring to prevent the giving of unsterilised milk to infants and young children.

Tuberculous animals must be found and destroyed. There is nothing else to be done with them—the more especially now we know that tuberculosis, elsewhere than in the udder of a cow, may yet infect her milk. The owners must be compensated, until such time as we may assume that the occurrence of tuberculosis is the owner's own fault or own risk, and then he must accept the consequences.

Tuberculosis is no more necessary in cattle than in human beings: in either case it can be controlled by proper hygiene. It appears that animals which live under natural conditions do not suffer from tubercle. When they are cooped up in ill-ventilated places, then it appears. What *exactly* may be the key to this we cannot say until we have discovered that part of the life-history of the tubercle bacillus which is spent outside the body of any host. We do not know its natural reservoir, so to say. But

already we can control its development, and we must do so.

It is just as possible to construct for cattle as for human beings, houses which are properly ventilated, properly drained and properly illuminated by sunlight. We know for certain that exposure to sunlight and fresh air very soon kills the tubercle bacillus. I have seen cow-houses, not far from London, so constructed that the only possible risk of tuberculosis for the cattle, was from the expectoration of their attendants, just as the only risk to the anthropoid apes at the "Zoo" is from the expectoration of the visitors—and the glass screens avert that. The milk supplied by these properly cared for and housed cows is abundant and of high quality, and though at present it costs somewhat more than ordinary milk, I do not for a moment believe that the general supply of milk produced under proper conditions is economically impracticable. For a few years the average cost may be raised: but the application of modern knowledge to the feeding of the cattle, together with improvement in the conditions of transit, should soon lower the figure again. Anyhow, it is better to pay a little more for milk which contains no tubercle than a little less for milk which does.

Public opinion in all civilised communities must be rapidly ripened by the publication of the Royal Commission's Report, and corresponding legislation must be obtained. We in Great Britain look anxiously and eagerly to Mr. John Burns and the Local Government Board for a bold, statesmanlike measure, which shall eradicate the evil altogether.

With its disappearance—which I take to be a matter of less than a decade at the very outside—the whole mass of tuberculosis due to the bovine

bacillus will disappear, and that will be the blessed end of Listerism so far as one of the largest fields of its present activity is concerned.

Bovine tuberculosis is the magnificent and urgent example of the promise of the future. In this case we wait for no further knowledge: we possess all we require in order to exterminate the disease altogether. It furnishes a type of what we shall come to as regards the greater part of the activities of Listerism. Of very small importance relatively, but still worth noting, is another of the maladies to which reference has been made in earlier pages for the achievements of Listerism in alleviating it. I refer to rickets, still a very common disease, and one which frequently furnishes Listerism with triumphs. It is an entirely unnecessary and inexcusable disease. Rickets is not congenital, but the post-natal consequence of post-natal malnutrition. It will disappear just so soon as we rightly rate in this country the products of our constantly diminishing birth-rate, and protect children from the consequences of ignorance and neglect—as I say, not necessarily on any decent grounds of humanity or sympathy, but, if you will, simply because one cannot have a soldier or a sailor unless one first has saved a baby. Above all, rickets will disappear when instruction in the elements of infant and child feeding is given to all girls in our schools, even at the cost of some inattention to the particular selection of fictions commonly miscalled history. Here, again, the promise of the future, the best promise that can be conceived, is that there shall be no more Listerism.

Unlike the deformities induced by rickets, there are a number, of which clubfoot is the commonest, which are due to causes acting before birth. Here

Listerism is constantly in demand, and exceedingly useful. The causation of these deformities is still unknown, even to such an ardent student of antenatal pathology as Dr. J. W. Ballantyne, and they are correspondingly beyond our control to prevent. It is probable that, for very many years to come, Listerism will be in employment here, as to-day.

For accidents, and the deformities due to accidents, Listerism will always be required, and the promise of the future, in this respect, is clearly that the possibilities of grafting bone and muscle and tendon and nerve and skin have not yet been nearly exhausted. With the perfection of his aseptic technique, the surgeon will find himself more and more able to deal with deformities and accidents in a constructive fashion. In cases where, only a few years ago, Listerism did splendidly to save the limb or the life, at whatever cost of deformity or uselessness, surgeons will more and more find it possible to replace ruined structures by healthy ones, either obtained from one of the lower animals, or from some human being who, for one reason or another, can spare them. The state of public and professional sentiment in Germany and Austria permits the making of experiments in these directions to an extent which we should not countenance here, but we shall profit by them in due course, nor does it follow that our surgeons are less skilful or devoted because they do not happen to lead in this particular field.

Syphilis and the surgical requirements to which it leads, together with its venereal ally, are definitely diminishing in Great Britain at the present time. These, being contagious, are diseases as eminently preventable as leprosy. It is a scandal of the first order that the stupidity, the prudery, the faithless-

ness, and the brutal selfishness of public opinion, should combine to prevent the taking of any effective measures against these eminently preventable evils, one of which is the direct cause demanding so much major abdominal surgery in the case of women. I repeat here the demand made by several of us in a deputation to the Local Government Board in 1911, that power should be given to the authorities for compulsory detention of persons suffering from these diseases in certain stages, on account of the appalling danger to the present and to the future. It is a farce and a crime that we should be compelled to notify measles and scarlet fever, and that children suffering from them should be forcibly confined, whilst men suffering from foul and abominable maladies like syphilis and gonorrhœa should be allowed to do as they please and go where they please. The next step, most urgently demanded in the interests of the public health, is the compulsory notification of these diseases whenever and wherever they are diagnosed. The time is not far distant when they will be eliminated from the body-politic, and a very large field of surgery, most notably that due to the infection of innocent women, wives and mothers, with gonorrhœa, will henceforth disappear for ever.

As regards appendicitis, the state of pathology warrants no very positive statements, nor any indictment of the public. This exceedingly common malady —there are probably about 40,000 cases annually in Great Britain—for which the surgeon constantly does so much, is probably due to a very common, if not practically ubiquitous microbe: and why it should assume malign activity at one time and not at another is more than we can yet say There seems

to be real evidence for the view, however—which were best expressed not too precisely—that errors in diet are associated with the incidence of appendicitis, though how, it is as yet impossible to say. No pathologist or bacteriologist would hesitate, however, to assert that in the not remote future we may expect to define the conditions in which appendicitis arises, and to state the dietary precautions, probably by no means onerous, which are necessary in order to prevent it. It is quite likely, furthermore, that even before we have learnt to prevent appendicitis, the bacteriologists will be able to provide us with a microbic product, of the nature of a vaccine or serum or antitoxin, which will control the inflammation in its earliest stages and render the use of the knife superfluous.

Whilst the prevention of disease must be given the forefront in this chapter, with its promise that, over a great range of existing pathology, neither the knife nor any other remedy will in the coming time be called for, we may now especially consider those developments of bacteriology which promise, before very long, to introduce new remedies for many "surgical diseases," compared with which even the Listerian knife is a piece of clumsy barbarism. It has been granted that the whole range of the surgical inflammations are due to microbes, now almost completely identified. Whilst the surgeon has to avoid their introduction in all cases, in many it is their presence which calls for his interference. The appendicitis, or peritonitis, or arthritis, or osteitis, or what not, is a microbic disease, and his knife is called upon either to drain or to extirpate. The purely tuberculous inflammations also come under this category.

Now the very definite promise of the bacteriologists is that they will ere long be able to provide us with specific chemical remedies which will carry all these maladies over into the realm of medicine again, and leave the surgeon's knife unrequested. In some cases, as is suggested by Ehrlich's "Salvarsan" or "606" in syphilis, chemistry may elaborate substances which kill the peccant parasites outright, leaving the body the very simple task of "cleaning up the mess," and affording no opportunity at all for the surgeon. In other cases, it may be an antitoxin which supplies the need. Thus, to consider what has been already accomplished, the introduction of diphtheria antitoxin has reduced, probably by hundreds or thousands of cases annually, the number of instances in which the surgical operation called tracheotomy is required. Formerly, any case of diphtheria might, in a few hours, reach the point at which only the opening of the windpipe or trachea would permit the patient any longer to breathe. Nowadays the antitoxin, in universal employment, controls the disease so efficiently that the surgeon's knife is required only in cases which, for one reason or another, have been neglected. Listerian tracheotomy is a very fine thing, and has saved a multitude of little lives, but obviously the diphtheria antitoxin is better still.

Some similar product may at any moment give us the control of surgical and all other forms of tuberculosis, even before the disease is altogether prevented, which is the ideal and immediately feasible way of dealing with it.

For many years past, sera have been prepared from the commoner agents of surgical inflammation, the staphylococcus and the streptococcus; and

many observers have reported well of their use in puerperal fever, peritonitis, erysipelas, and other surgical conditions. None of these sera, however, have approached the efficacy of the antitoxin in the case of the diphtheria bacillus, and there are evidently many subtleties of chemistry to be unravelled before a completely satisfactory method of dealing with these organisms can be obtained. But it certainly will be obtained, and may be granted us at any moment. The field of Listerism will thereupon be more severely restricted than ever. The whole range of the surgical inflammations, from appendicitis downwards, will become "medical diseases" once more, and will be rapidly and safely controlled by appropriate doses of medicine of a new kind, elaborated by the bacteriologist in his laboratory. But though the knife will remain unused, Pasteur and Lister, who taught us what inflammation is, will be healing there also.

It may now be taken as practically certain that cancer is not a microbic disease. The malignant tumours, including cancer and sarcoma, still defy elucidation, as do their innocent allies. For these latter, in especial, such as the fibro-muscular tumours of the uterus, fatty tumours and so forth, it is probable that Listerism will be required for not a few years yet to come. The chemical conditions of their development are yet far beyond our elucidation, and therefore far beyond our control. But as regards the malignant tumours, for which Listerism is now rightly more employed than ever heretofore, the prospect is extremely hopeful, and at any time the discovery may be made which will for ever banish the knife from this field. The public opinion that there is something peculiarly hopeless about the

problem of cancer is not shared by experts. So much definite progress has been made within the past decade that the time can scarcely be far distant when the knife will be rendered superfluous by the introduction of chemical substances in the presence of which malignant cells cannot live.

The key to the solution of this problem, as I have maintained for many years, is to be found in the chemistry of those human or animal patients in whom there occurs spontaneous recovery from malignant growths. If these cases be adequately studied, the solution of the problem must be found. Hitherto, however, they have been too much regarded as merely curiosities, which did not demand the help of the surgeon, and were therefore of no further interest to him.

Meanwhile, though at any moment the whole aspect of the question may be changed, it is the duty of all who write for the public eye on this subject to insist that the earliest possible recourse to Listerism offers the best hope in all cases of cancer; and any reader who will consult the pages of Mr. Childe's book, referred to in my opening chapter, will realise that modern Listerism accomplishes very great things in this field. May the day, nevertheless, soon dawn, when Listerism is banished from it for ever.

It will be plain to the reader that, with the introduction of an efficient chemical antidote to cancer, and of anti-sera and similar bodies for microbic infection, the field of Listerism in the future will be enormously contracted. To anyone who has any idea of the subtlety and delicacy of the living body and of the living cells of which it is composed, even the cleanest knife must appear a brutal and barbaric

instrument. It is bio-chemistry, or the chemistry of life, which will yearly make this more clear, meanwhile giving us more and more control over vital processes in all their stages. The remoter promise of the future thus excludes the knife altogether from the *armamentarium* of the healing art, except in cases of accident.

But even when we have relegated the knife to museums, and when battlefields are no more, Listerism will still be in nightly and daily demand for its unique and irreplaceable services to motherhood. There is no inherent reason why the bio-chemistry of the future should not control death altogether—though whether that were worth doing is another question. Meanwhile there will always be need of births, and wherever a new human life comes into the world, there Listerism will guard the portals, protecting mother and child alike.

Sociologically, then, I would say that the promise of the future is for the access of Listerian protection to all motherhood. The reader must pardon my insistent return, as a Eugenist, to this subject in my closing pages. Radical progress, which means racial progress, in the future can only be assured through parenthood. The nineteenth century did well, in many ways, for external conditions, and for the amplification of man's power upon external things. The eugenic century must deal with man himself, and so long as man is mortal, this means that it must work primarily through parenthood and the conditions of parenthood. Those who believe this will repeat it so persistently that at last people will begin to think they have thought it for themselves, and then we shall get what we demand. Notwithstanding all the efforts of the patriots and the pamphleteers

and the pulpit orators and the press, the birth-rate will persistently fall, not *alone*, as I am now inclined to suspect, from purely volitional causes. The only remedy will be to attend more scrupulously to such mothers and babies as we have : and the first demand is the certain and complete provision of expert modern Listerism for every mother in the land, high or low, young or old, married or unmarried. Incidentally we shall abolish perhaps one-third of all the nation's blindness, and even that great boon will be the least of it. Puerperal fever will wholly disappear, when all mothers are properly looked after for at least a month before confinement, during confinement, and for a fortnight or so thereafter. A vast amount of present-day Listerism, which concerns itself with the " diseases of women," will be no longer in request when Listerism is rightly available at woman's great crisis. Indirectly the rate of infant mortality will be reduced, and the initial stages of post-natal life on the part of the survivors will be safeguarded, with permanently satisfactory results.

In no country in the world are these conditions even approximately established, but if modern civilisation is to survive against the internal causes of its degeneration, it must establish such conditions, well realising that the mothers are necessarily the first charge upon the resources of any nation that is to endure.

Here, then, our account may end. I have endeavoured to set forth the remarkable history of Listerism, and to indicate its past and present services to the world ; and finally, to herald those imminent advances of science, preventive and curative, which will substantially supersede

any occasion for Listerism whatever, except in the noblest task to which this or any other form of knowledge or power can be called—that of serving those who give birth to the life of this world to come.

FINIS

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